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SAR Test Report, FCC ID: PY7F3022019

Document number:	EAB-08:010907 Uen Rev D	**Date of report:**	2008-03-04
Testing laboratory:	Ericsson EMF Research Laboratory Ericsson AB SE-164 80 Stockholm Sweden	**Company/Client:**	Lars Melin Sony Ericsson Mobile Communications AB Box 64 SE-164 94 Stockholm Sweden
Test performed by:	Martin Siegbahn Björn Hansson Sonja Hiltunen Daniel Göker	**Date of tests:**	January 27 – February 4 2008
Manufacturer and market name(s) of device:	Sony Ericsson Mobile Communications AB, G900		
Testing has been performed in accordance with:	IEEE Std 1528, IEC 62209-1, FCC OET Bulletin 65 Supplement C		
Test results:	The tested device complies with the requirements in respect of all parameters subject to the test.		
Additional information:			

Signature:

Responsible test engineer	Quality manager
Martin Siegbahn Senior Research Engineer martin.siegbahn@ericsson.com Tel: +46 8 7570811	Christer Törnevik Director, EMF Health and Safety christer.tornevik@ericsson.com Tel: +46 8 7641235

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1 Summary of SAR Test Report[1]

1.1 Equipment under test (EUT)

Serial Number	CB5A0M8YY4 (Used for GSM/GPRS testing) CB5A0M8JM4 (Used for WLAN testing)
Type Number	FAD-3022019-BV
Device ID	FCC ID: PY7F3022019 IC: 4170B-F3022019
Accessories used in testing	Handsfree HPM-62, Bluetooth handsfree HBH-20, Bluetooth handsfree HBH-DS970, Battery BST-33
Hardware status	Pre-production AP1.1b
Notes	-

Frequency Band [MHz]	**850**		**900**	**1800**	**1900**		**2100**	**2450**
Modes	GSM GPRS	WCDMA	GSM GPRS	GSM GPRS	GSM GPRS	WCDMA	WCDMA	WLAN
Supported	☐	☐	☑	☑	☑	☐	☑	☑
Covered by report	☐	☐	☐	☐	☑	☐	☐	☑
Data and connectivity	*GPRS class 10, GPRS capability class B, Bluetooth class 1, WLAN 802.11b/g*							
Exposure environment	*General public*							

1.2 Results

The maximum SAR values are given in the table below. The device conforms to the requirements of the relevant standards when the maximum SAR value is less than or equal to the limit.

Results applicable to the 1g SAR limit of 1.6 W/kg:

	Mode	**Channel/ Frequency (MHz)**	**Position**	***Max SAR$_{1g}$* for single mode operation**	***Max SAR$_{1g}$ for multi-mode operation*[2]**	**SAR$_{1g}$ limit[3]**	**Result**
HEAD	GSM 1900	810/1909.8	Right, Cheek	1.39 W/kg	1.39 W/kg	1.6 W/kg	**PASSED**
BODY	GSM 1900	810/1909.8	Back, 15mm	0.49 W/kg	0.73 W/kg	1.6 W/kg	**PASSED**
BODY	GPRS 1900	810/1909.8	Back, 15mm	1.06 W/kg	1.22 W/kg	1.6 W/kg	**PASSED**
HEAD	WLAN	1/2412	Right, Cheek	0.61 W/kg	-	1.6 W/kg	**PASSED**
BODY	WLAN	1/2412	Back, 15mm	0.16 W/kg	-	1.6 W/kg	**PASSED**

Extended Uncertainty (k=2) 95%	*± 21.9 %*

1 This page contains a summary of the test results. The full report provides a complete description of all test details and results.

2 GSM/GPRS and WLAN/Bluetooth transmitting simultaneously. WLAN and Bluetooth cannot transmit simultaneously.

3 SAR limit applicable in USA and Canada

2 General information

The tests reported in this document have been performed in accordance with the SAR measurement standards IEC 62209-1 [1], IEEE Standard 1528 [2] and the FCC OET Bulletin 65 Supplement C [3]. The purpose of the tests was to verify that the EUT is in compliance with the appropriate RF exposure standards, recommendations and limits [3-4].

3 Equipment under test

The tables below summarize the technical data for the equipment under test. Photographs of the device are presented in Appendix A.

Device model	Type No: FAD-3022019-BV FCC ID: PY7F3022019 IC: 4170B-F3022019
Serial number of tested unit(s)	CB5A0M8YY4 (Used for GSM/GPRS testing) CB5A0M8JM4 (Used for WLAN testing)
Mode(s) covered by this report	GSM/GPRS1900 WLAN 802.11b/g Bluetooth
Antenna(s)	Internal
Maximum output power level[4] (dBm)	GSM/GPRS(1TS)1900: See table below GPRS(2TS)1900: See table below WLAN 802.11b/g: See table below. Bluetooth: 6.5
GPRS Class, GPRS capability class	10, B
Duty cycle(s)	1:8 (GSM), 1:4 (GPRS), 1 (WLAN)
Transmitter frequency range (MHz)	GSM1900: 1850.2-1909.8 WLAN, US: 2412-2462
Hardware status	Pre-production AP1.1b
Software(s)	CB5A0M8YY4 (Used for GSM/GPRS testing): 1203-6566 R9K007, 1200-5567 R1D, 1203-8784 R6G803, 1204-3148 R6G803 CB5A0M8JM4 (Used for WLAN testing): Sony Ericsson test sw: s_emc_Tyra v.2.4.31_WL
Tested accessories	Stereo handsfree HPM-62 Bluetooth handsfree HBH-20 Bluetooth handsfree HBH-DS970
Tested batteries	BST-33

4 Output power level of the phone at the antenna port for the maximum power setting. This equals the nominal output power level plus the tolerance in production.

GSM/GPRS 1900 MHz Output power					
Mode	Nominal output power (dBm)	Tolerance, upper limit (dB)	EUT power (dBm)		
			Ch 512	Ch 661	Ch 810
GSM/GPRS(1TS) 1900	30.0	+0.5	30.5	30.5	30.5
GPRS(2TS) 1900	30.0	+0.5	30.5	30.5	30.5

WLAN Output power[5]					
Mode	Nominal output power (dBm)	Tolerance, upper limit (dB)	EUT power (dBm)		
			Ch 1	Ch 6	Ch11
802.11b 1Mbit/s	16.5	+1.0	17.1	17.3	17.6
802.11b 2 Mbit/s			17.1	17.4	17.3
802.11b 5.5 Mbit/s			17.1	17.4	17.4
802.11b 11Mbit/s			17.1	17.4	17.5
802.11g 6Mbit/s	12.5	+1.0	13.8	13.4	12.6
802.11g 9Mbit/s			13.9	13.5	12.6
802.11g 12Mbit/s			13.7	13.5	12.6
802.11g 18Mbit/s			14.1	13.6	13.1
802.11g 24Mbit/s			13.9	13.5	12.8
802.11g 36Mbit/s			14.0	13.6	12.9
802.11g 48Mbit/s			13.9	13.6	12.9
802.11g 54Mbit/s			14.0	13.5	12.9

[5] The WLAN platform of the EUT does not support fine tuning of the output power.

4 Test equipment

4.1 Dosimetric system

The SAR measurements were made using the DASY4 professional near-field scanner by Schmid & Partner Engineering AG that was installed in December 2002. An uncertainty budget including total uncertainty (k=1) and expanded uncertainty (k=2) for 1g and 10g SAR assessments is found in section 7. The equipment list is given below. In Appendix E calibration parameters for the SAR test probe(s) are listed.

Description	Serial number	Calibration due date	Calibration interval
Probe electronics, DAE3	S/N 422	2008-05-23	12 months
Probe electronics, DAE3	S/N 304	2008-10-15	12 months
E-field probe, ES3DV3	S/N 3113	2008-06-14	12 months
E-field probe ET3DV6	S/N 1394	2008-10-24	12 months
Dipole validation kit, D1900V2	S/N 510	NA	NA
Dipole validation kit D2440V2	S/N 705	NA	NA
SAM Phantom (SAM2)	S/N TP-1004	NA	NA

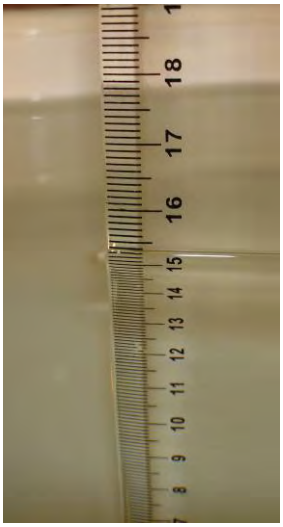
4.2 Additional equipment

Description	Serial number	Calibration due date	Calibration interval
Dielectric probe kit, HP 85070C	S/N US99360060	NA	NA
Network analyzer, HP 8752C	S/N 3410A03732	2008-10-18	12 months
Power meter, R&S NRVS	S/N 848888/052	2008-06-06	24 months
Power sensor, R&S NRV-Z5	S/N 849895/030	2008-06-06	24 months
Universal radio communication tester, R&S CMU 200	S/N 107639	2008-05-04	12 months
Thermometer, EBRO TFX-392SKWT	S/N 10130918	2008-10-22	12 months

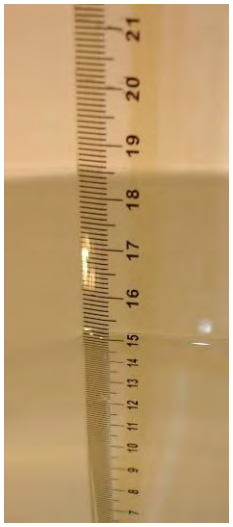
5 Electrical parameters of the tissue simulating liquids

The parameters of the tissue simulating liquids were measured using the network analyzer and the dielectric probe kit prior to the SAR measurement. The results are shown in the table below. Specified standard values for the permittivity and the conductivity are given in [1-3]. The measured values are within 5% of the standard values. The mass density of the liquid entered into the DASY4 program was 1000 kg/m^3. The depth of the tissue simulating liquid was 15±0.5 cm as shown in the figures below.

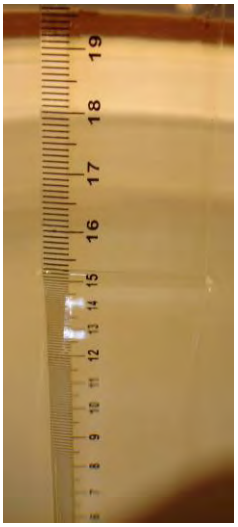
f (MHz)	Liquid type	Measured/Specification	ε_r	σ (S/m)
1900	Head	Measured	38.5 to 38.7[7]	1.35 to 1.36[7]
		Specified value	40.0	1.40
		Difference (%)	-3.8 to -3.2	-3.6 to -2.9
	Body (muscle)	Measured	51.4 to 52.2[6]	1.56 to 1.59[7]
		Specified value	53.3	1.52
		Difference (%)	-3.6 to -2.1	+2.6 to +4.6
2450	Head	Measured	37.3	1.88
		Specified value	39.2	1.80
		Difference (%)	-4.8	+4.4
	Body (muscle)	Measured	50.5	2.04
		Specified value	52.7	1.95
		Difference (%)	-4.2	+4.6



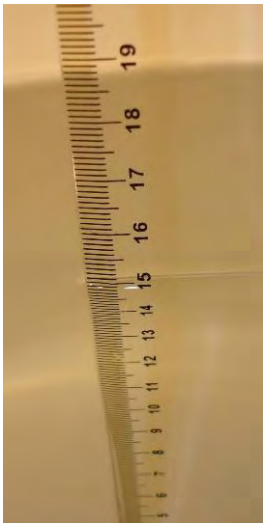
Measured level (153 mm, head section) of 1900 MHz head tissue simulating liquid in phantom.



Measured level (152 mm, flat section) of 1900 MHz muscle tissue simulating liquid in phantom



Measured level (153 mm, head section) of 2450 MHz head tissue simulating liquid in phantom



Measured level (151 mm, flat section) of 2450 MHz muscle tissue simulating liquid in phantom

[6] Measurements were conducted over several days and the parameters were in the stated range.

6 SAR system performance check

System performance checks for the DASY4 were conducted before the SAR measurements with the D1900V2 and D2440V2 dipole kits and the obtained results are displayed in the table below. The results are within 10% of the reference values [2][5]. Evaluations prior to the SAR testing showed that the maximum SAR system noise was below 2 mW/kg, which is below the standard requirements. The temperature of the test facility during the system performance checks was in the range 20°C to 25°C.

f (MHz)	Liquid type	Measured/ Reference	SAR 1g (W/kg)	SAR 10g (W/kg)	ε_r	σ (S/m)	Liquid temp (°C)	Date
1900	Head	Measured	41.4	21.8	38.5	1.36	22.8	2008-01-30
		Reference [2]	39.7	20.5	40.0	1.40	-	-
		Difference (%)	+4.3	+6.3	-3.8	-2.9	-	-
	Body (muscle)	Measured	42.4	21.9	51.4	1.56	21.7	2008-02-02
		Reference [5]	40.4	21.1	53.3	1.52	-	-
		Difference (%)	+5.0	+3.8	-3.6	+2.6	-	-
2450	Head	Measured	56.8	26.3	37.3	1.88	24.3	2008-01-29
		Reference [2]	52.4	24.0	39.2	1.80	-	-
		Difference (%)	+8.4	+9.6	-4.8	+4.4	-	-
	Body (muscle)	Measured	59.3	27.4	50.5	2.04	23.1	2008-01-27
		Reference [5]	54.5	25.2	52.7	1.95	-	-
		Difference (%)	+8.8	+8.7	-4.2	+4.6	-	-

7 Uncertainty evaluation of SAR measurement system DASY4 according to IEC 62209-1 [1] and IEEE 1528 [2]

Uncertainty Component	Section in IEEE 1528	Uncer. (%)	Prob Dist.	Div.	$C_{i,1g}$	$C_{i,10g}$	Std. Uncer. (1g) (%)	Std. Uncer. (10g) (%)
Measurement System								
Probe Calibration	E2.1	±5.9	N	1	1	1	±5.9	±5.9
Axial Isotropy	E2.2	±4.7	R	√3	0.7	0.7	±1.9	±1.9
Spherical Isotropy	E2.2	±9.6	R	√3	0.7	0.7	±3.9	±3.9
Boundary Effect	E2.3	±1.0	R	√3	1	1	±0.6	±0.6
Linearity	E2.4	±4.7	R	√3	1	1	±2.7	±2.7
System Detection Limits	E2.5	±1.0	R	√3	1	1	±0.6	±0.6
Readout electronics	E2.6	±0.3	N	1	1	1	±0.3	±0.3
Response time	E2.7	±0.8	R	√3	1	1	±0.5	±0.5
Integration time	E2.8	±2.6	R	√3	1	1	±1.5	±1.5
RF Ambient Noise	E6.1	±3.0	R	√3	1	1	±1.7	±1.7
RF Ambient Reflections	E6.1	±3.0	R	√3	1	1	±1.7	±1.7
Probe Positioner	E6.2	±0.4	R	√3	1	1	±0.2	±0.2
Probe Positioning	E6.3	±2.9	R	√3	1	1	±1.7	±1.7
Max. SAR Evaluation	E5	±1.0	R	√3	1	1	±0.6	±0.6
Measurement System Uncertainty							±8.6	±8.6
Test Sample Related								
Device positioning	E4.2	±2.9	N	1	1	1	±2.9	±2.9
Device holder uncertainty	E4.1	±3.6	N	1	1	1	±3.6	±3.6
Power drift	6.6.3	±5.0	R	√3	1	1	±2.9	±2.9
Test Sample Related Uncertainty							±5.5	±5.5
Phantom and Tissue Parameters								
Phantom uncertainty	E3.1	±4.0	R	√3	1	1	±2.3	±2.3
Liquid conductivity (meas uncertainty)	E3.3	±2.5	N	1	0.64	0.43	±1.6	±1.1
Liquid conductivity (target)	E3.2	±5.0	R	√3	0.64	0.43	±1.8	±1.2
Liquid Permittivity (meas uncertainty)	E3.3	±2.5	N	1	0.6	0.49	±1.5	±1.2
Liquid Permittivity (target)	E3.2	±5.0	R	√3	0.6	0.49	±1.7	±1.4
Phantom and Tissue Parameters Uncertainty							±4.9	±3.4
Combined standard uncertainty							**±10.9**	**±10.7**
Extended standard uncertainty (k=2)							**±21.9**	**±21.4**

Uncertainty budget is applicable for both head and body measurements

8 Test results

The tables in this section show the measured 1g and 10g averaged SAR for the device and the corresponding values normalized to the maximum output power level. A universal radio communication tester was used to control the device during the SAR measurements on the mobile telephony band(s). In WLAN operation, the device transmitter was controlled using test software in the device operated via the keypad. All WLAN measurements were performed in accordance with [7]. WLAN transmission was set to the lowest data rate, 1 Mbit/s, in bursts with pulse repetition frequency 243 Hz and with duty-cycle 1/1.66. The measured results were then scaled to duty-cycle 1 giving a conservative maximum SAR value. The phone was supplied with a fully charged battery for the tests. The temperature of the test facility during the tests was in the range 20 to 25ºC. During the tests, the temperature of the tissue simulating liquid was within ±2ºC from the liquid temperature at system performance check.

The device was tested on the right-hand phantom, corresponding to the right side of the head, and the left-hand phantom for the cheek and tilt phone positions in the middle of each transmit band, corresponding to the channel 661 for GSM1900 and channel 6 for WLAN 802.11b. In Appendix B, pictures of the device positioned on the head phantom are shown. For the phone position giving the highest SAR result, the device was also tested at the lowest and the highest frequencies of the transmit band(s) corresponding to the channels 512 and 810 for GSM1900 and channels 1 and 11 for WLAN 802.11b. For the position and frequency giving the highest SAR result for the GSM1900 band, tests were performed with the Bluetooth transmitter turned on.

The device was also tested in body worn positions with the front and back side of the device facing the phantom on the middle channel of each transmit band. For the phone position giving the highest SAR result, the device was then tested at the lowest and the highest frequencies of each transmit band. For the position and frequency giving the highest SAR result for the GSM1900 band, tests were performed with the Bluetooth transmitter turned on. All tests in body worn positions were performed at 15 mm separation between the device and the flat phantom, with the stereo handsfree attached for speech and data modes (replaced by Bluetooth handsfree when Bluetooth enabled). In Appendix B, pictures of the device when positioned under the flat section of the phantom are shown.

The device can transmit simultaneously, either in WLAN mode or Bluetooth mode, with the mobile telephony modes. Multi-mode SAR results for these configurations are presented in the end of this section.

8.1 Results for the GSM1900 mode (head)

Configuration	Phone position		f (MHz)	Measured output power (dBm)	Measured (W/kg)		Normalized to max power, 30.5 dBm (W/kg)	
					SAR_{1g}	SAR_{10g}	SAR_{1g}	SAR_{10g}
	Left	Cheek	1880.0	30.5	0.74	0.48	0.74	0.48
		Tilt	1880.0	30.5	0.26	0.17	0.26	0.17
	Right	Cheek	1850.2	30.5	1.00	0.57	1.00	0.57
			1880.0	30.5	1.09	0.62	1.09	0.62
			1909.8	30.5	1.39	0.78	1.39	0.78
		Tilt	1880.0	30.5	0.36	0.23	0.36	0.23
Bluetooth	Right	Cheek	1909.8	30.5	1.33	0.75	1.33	0.75

Appendix D, Figures a-d, show SAR distributions for Right Cheek, Right Tilt, Left Cheek and Left Tilt positions, including the configuration giving the maximum 1g SAR for GSM1900 Head measurements.

8.2 Results for the GSM1900 mode (body)

Separation	Configuration	Phone position	f (MHz)	Measured output power (dBm)	Measured (W/kg)		Normalized to max power, 30.5 dBm (W/kg)	
					SAR_{1g}	SAR_{10g}	SAR_{1g}	SAR_{10g}
15mm between device and flat phantom	Stereo handsfree	Front	1880.0	30.5	0.40	0.25	0.40	0.25
		Back	1850.2	30.5	0.44	0.27	0.44	0.27
			1880.0	30.5	0.44	0.27	0.44	0.27
			1909.8	30.5	0.49	0.30	0.49	0.30
	Bluetooth on, no handsfree	Back	1909.8	30.5	0.73	0.43	0.73	0.43

Appendix D, Figure e, shows the SAR distribution for the configuration giving the maximum 1g SAR for GSM1900 Body measurements.

8.3 Results for the GPRS(2TS)1900 mode (body)

Separation	Configuration	Phone position	f (MHz)	Measured output power (dBm)	Measured (W/kg)		Normalized to max power, 30.5 dBm (W/kg)	
					SAR_{1g}	SAR_{10g}	SAR_{1g}	SAR_{10g}
15mm between device and flat phantom	Stereo handsfree	Front	1880.0	30.5	0.60	0.37	0.60	0.37
		Back	1850.2	30.5	0.85	0.54	0.85	0.54
			1880.0	30.5	0.84	0.51	0.84	0.51
			1909.8	30.5	1.06	0.63	1.06	0.63
	Bluetooth on, no handsfree	Back	1909.8	30.5	1.20	0.72	1.20	0.72

Appendix D, Figure f, shows the SAR distribution for the configuration giving the maximum 1g SAR for GPRS(2TS)1900 Body measurements.

8.4 Results for the WLAN 802.11b mode (head)

Configuration	Phone position		f (MHz)	Measured output power (dBm)	Measured (W/kg)		Normalized to max power, 17.5 dBm and duty-cycle=1 (W/kg)	
					SAR_{1g}	SAR_{10g}	SAR_{1g}	SAR_{10g}
	Left	Cheek	2437	17.3	0.21	0.12	0.37	0.20
		Tilt	2437	17.3	0.19	0.11	0.34	0.18
	Right	Cheek	2412	17.1	0.33	0.16	0.61	0.29
			2437	17.3	0.31	0.16	0.54	0.27
			2462	17.6	0.27	0.14	0.44	0.22
		Tilt	2437	17.3	0.25	0.13	0.43	0.22

Appendix D, Figures g-j, show SAR distributions for Right Cheek, Right Tilt, Left Cheek, Left Tilt positions, including the configuration giving the maximum 1g SAR for WLAN Head measurements.

8.5 Results for the WLAN 802.11b mode (body)

Separation	Configuration	Phone position	f (MHz)	Measured output power (dBm)	Measured (W/kg)		Normalized to max power, 17.5 dBm and duty-cycle=1 (W/kg)	
					SAR_{1g}	SAR_{10g}	SAR_{1g}	SAR_{10g}
15mm between device and flat phantom	Stereo handsfree	Front	2437	17.3	0.05	0.03	0.09	0.05
		Back	2412	17.1	0.09	0.05	0.16	0.09
			2437	17.3	0.08	0.04	0.14	0.08
			2462	17.6	0.08	0.04	0.13	0.07
	No handsfree	Back	2412	17.1	0.09	0.05	0.16	0.10

Appendix D, Figure k, shows the SAR distribution for the configuration giving the maximum 1g SAR for WLAN Body measurements.

8.6 Multi-mode maximum SAR

The multi-mode maximum SAR values are given in the table below. For the body position the values are the sum of the maximum SAR for modes that can be used simultaneously. Note, simultaneous operation of WLAN and Bluetooth is not possible; hence SAR values used for the summation are the maximum results for the GSM 1900 band combined with either WLAN or Bluetooth. Summation of maximum SAR for obtaining multi-mode SAR is according to the procedures in [6]. The summation is conducted for the maximum SAR values for each mode, regardless if the values were obtained for different test configurations/phone positions, and will then represent a conservative estimate of the multi-mode SAR.

For the head position the maximum multi-mode SAR has been evaluated according the alternative procedure in [6] where the multi-band SAR is selected as the highest of the two separate maxima at the two frequencies. This requires that the maxima are separated to such extent that the highest value differs in level by less than 5 % from the resulting maximum peak SAR value if the two SAR distributions are added spatially. The two SAR distributions seen in Appendix D (a) and (g) were analyzed and the maximum peak SAR for the GSM1900 mode changed only 3% when the contribution from the WLAN SAR distribution in the location of the GSM1900 maximum was added. Thus, the maximum averaged SAR for the GSM1900 mode is selected as the maximum multi-mode averaged SAR.

Additionally, in a newly published document [8] from FCC it is stated that when the SAR to antenna separation ratio for a pair of antennas is < 0.3, SAR evaluation for simultaneous transmission is not required. The ratio is determined by dividing the sum of the stand-alone 1-g SAR for each pair of antennas, by the closest antenna separation distance in centimeters. The closest distance between the GSM/WCDMA antenna and the WLAN antenna of the EUT is 7.5 cm. Thus, the SAR to antenna separation ratio for the EUT for the head position multiband SAR equals (1.39+0.61)/7.5≈0.27, which is below 0.3.

Usage position	**Modes**	**Multi-mode SAR, normalized to max power for both modes (W/kg)**	
		SAR_{1g}	**SAR_{10g}**
Head	GSM1900 & WLAN	1.39	0.78
Body	GSM1900 & Bluetooth	0.73	0.43
	GPRS1900(2TS) & WLAN	1.22	0.73

9 Conclusion

The results above show that the maximum SAR for the EUT is below the applicable SAR limits. Consequently, the EUT is in compliance with the appropriate RF exposure standards and recommendations.

10 References

[1] IEC 62209-1, International Standard, "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Humans models, instrumentation, and procedures – Part 1: Procedure to determine the Specific Absorption Rate (SAR) for hand-held mobile devices used in close proximity of the ear (frequency range of 300 MHz to 3 GHz)", IEC, February 2005.

[2] IEEE, Standard 1528, "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.", The Institute for Electrical and Electronics Engineers (IEEE) Inc., June 2003.

[3] FCC, "Evaluating Compliance with FCC Guidelines from Human Exposure To Radiofrequency Electromagnetic Fields", Supplement C Edition 01-01 to OET Bulletin 65 Edition 97-01, June 2001.

[4] ANSI/IEEE Std C95.1-2005 (Revision of IEEE Std C95.1-1991), "Safety levels with respect to human exposure to radio frequency electromagnetic fields, 3 kHz to 300 GHz", The Institute of Electrical and Electronics Engineers Inc., New York, 2006.

[5] EAB/TF-03:090, "Calculation of reference SAR values for system performance checks with muscle tissue simulating liquid", Ericsson technical report, December 2006.

[6] IEC 62209-2 Ed.1: "Human exposure to radio frequency fields from handheld and body-mounted wireless communication devices – Human models, instrumentation, and procedures – Part 2: Procedure to determine the specific absorption rate (SAR) for mobile wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz), Committee Draft, July 2007.

[7] FCC KDB248227, "SAR Measurement Procedures for 802.11 a/b/g Transmitters", May 2007.

[8] FCC KDB648474 D01, "SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas", February 2008.

11 Revision History

Rev.	Date	Description
A	2008-02-08	First revision
B	2008-02-13	Battery picture replaced, Footnote on page 5 corrected
C	2008-03-04	Multi-band SAR evaluation text updated with reference to newly published FCC guidance.

APPENDIX C: SAR distribution plots for the system performance checks

System performance check at 1900 MHz (Body) conducted February 2nd

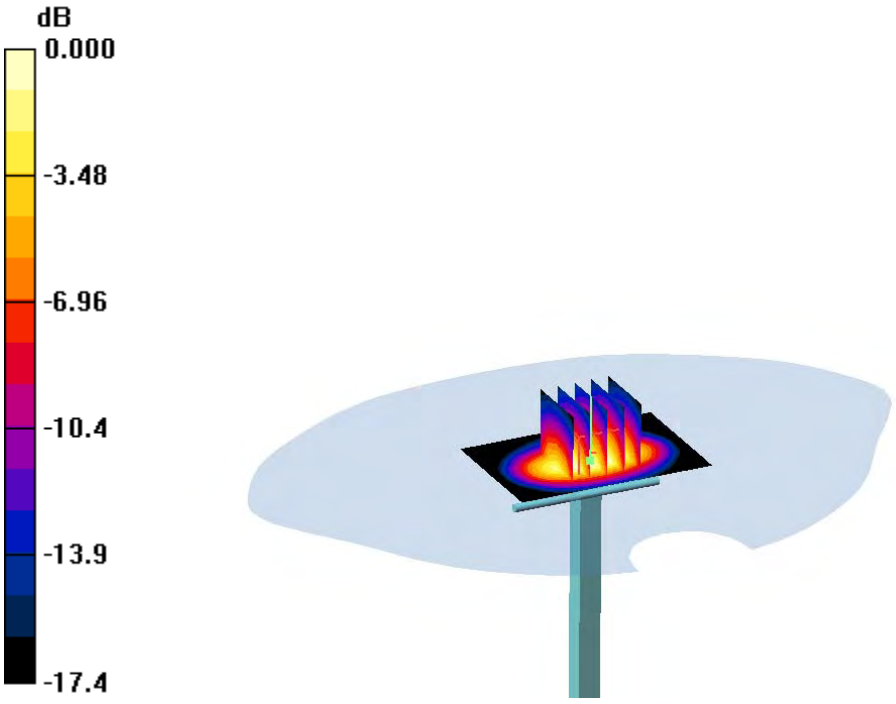
Date/Time: 2008-02-02 13:45:54

-Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
-Medium: Muscle 1950 MHz; σ = 1.56 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3

DASY4 Configuration:
-Probe: ES3DV3 - SN3113; ConvF(4.71, 4.71, 4.71)
-Electronics: DAE3 Sn304
-Phantom: SAM 2; Type: Serial: TP1004
-Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

d=10mm, Pin= 254.7 mW/Area Scan (61x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 12.5 mW/g

d=10mm, Pin= 254.7 mW/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 86.4 V/m; Power Drift = -0.111 dB
Peak SAR (extrapolated) = 20.0 W/kg
SAR(1 g) = 10.8 mW/g; SAR(10 g) = 5.57 mW/g
Maximum value of SAR (measured) = 12.1 mW/g



0 dB = 12.1mW/g

System performance check at 1900 MHz (Head) conducted January 30th

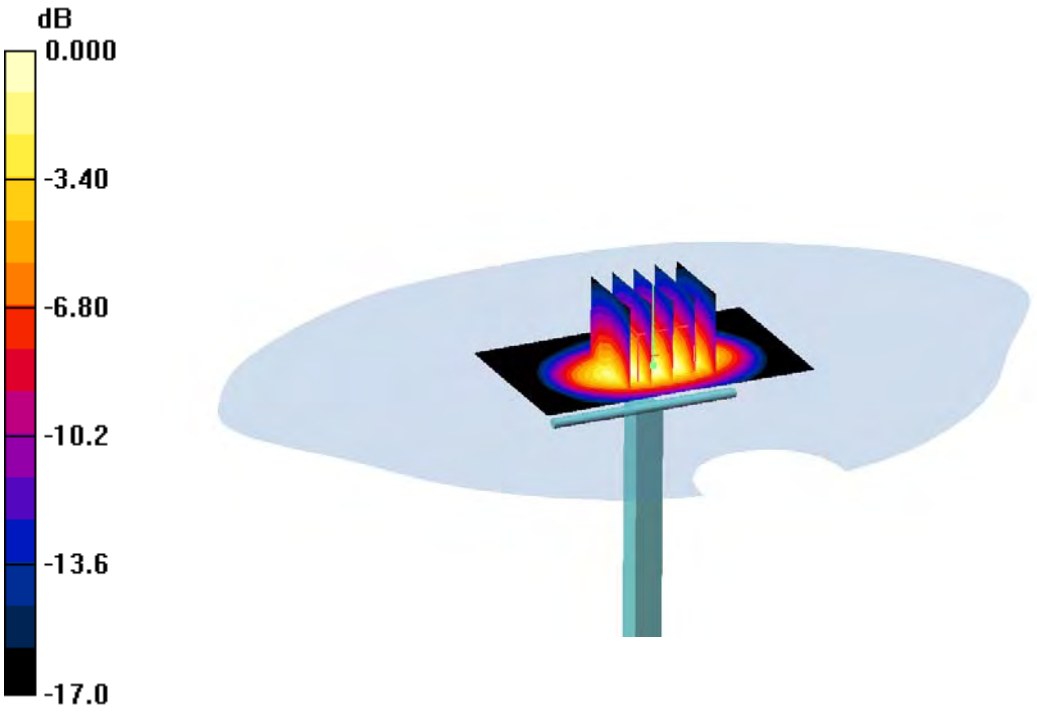
Date/Time: 2008-01-30 16:20:41

-Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
-Medium: Head 1900 MHz; σ = 1.36 mho/m; ε_r = 38.5; ρ = 1000 kg/m^3

DASY4 Configuration:
-Probe: ES3DV3 - SN3113; ConvF(4.83, 4.83, 4.83)
-Electronics: DAE3 Sn304
-Phantom: SAM 2; Serial: TP1004
-Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

10 mm Pin= 249 mW/Area Scan (61x101x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 11.7 mW/g

10 mm Pin= 249 mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 86.7 V/m; Power Drift = -0.077 dB
Peak SAR (extrapolated) = 18.7 W/kg
SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.42 mW/g
Maximum value of SAR (measured) = 11.6 mW/g



0 dB = 11.6mW/g

System performance check at 2440 MHz (Body) conducted January 27th

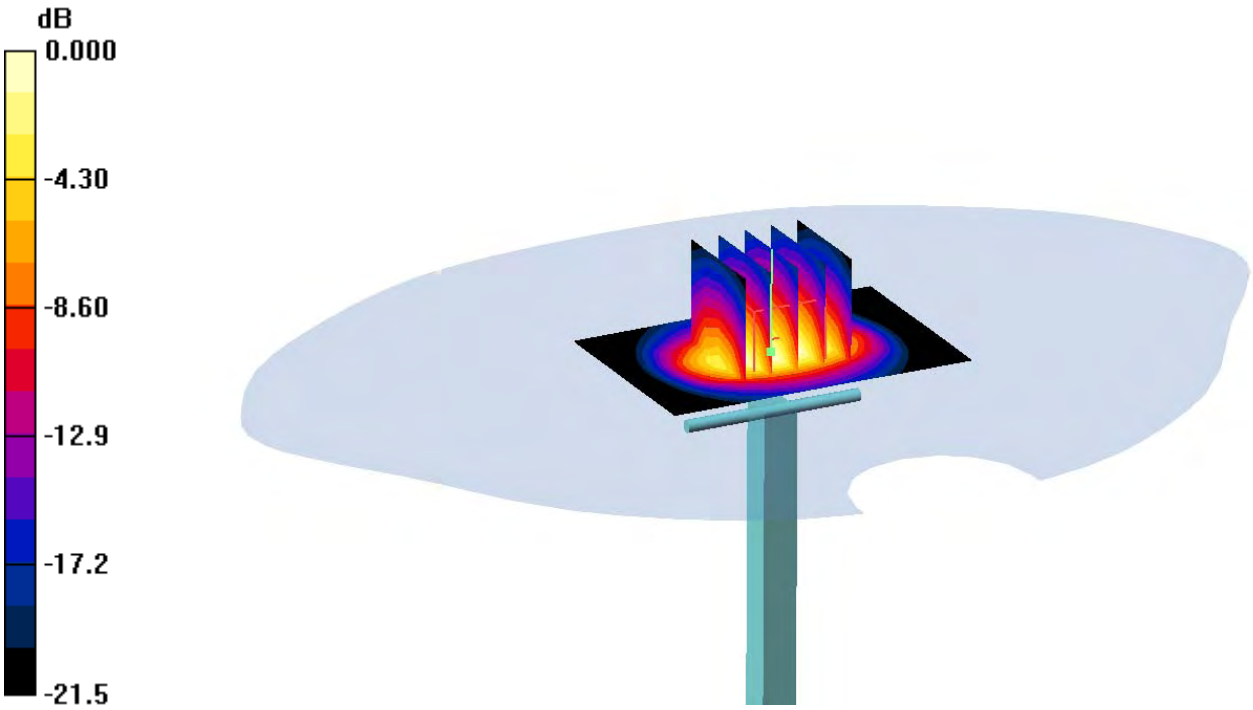
Date/Time: 2008-01-27 10:28:29

-Communication System: CW; Frequency: 2440 MHz; Duty Cycle: 1:1
-Medium: Body 2450 MHz; σ = 2.04 mho/m; ε_r = 50.5; ρ = 1000 kg/m^3

DASY4 Configuration:
-Probe: ES3DV3 - SN3113; ConvF(4.02, 4.02, 4.02)
-Electronics: DAE3 Sn422
-Phantom: SAM 2; Serial: TP1004
-Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

d=10mm, Pin=244.7 mW/Area Scan (61x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 17.1 mW/g

d=10mm, Pin=244.7 mW/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 90.9 V/m; Power Drift = -0.027 dB
Peak SAR (extrapolated) = 30.2 W/kg
SAR(1 g) = 14.5 mW/g; SAR(10 g) = 6.7 mW/g
Maximum value of SAR (measured) = 16.5 mW/g



0 dB = 16.5mW/g

System performance check at 2450 MHz (Head) conducted January 29th

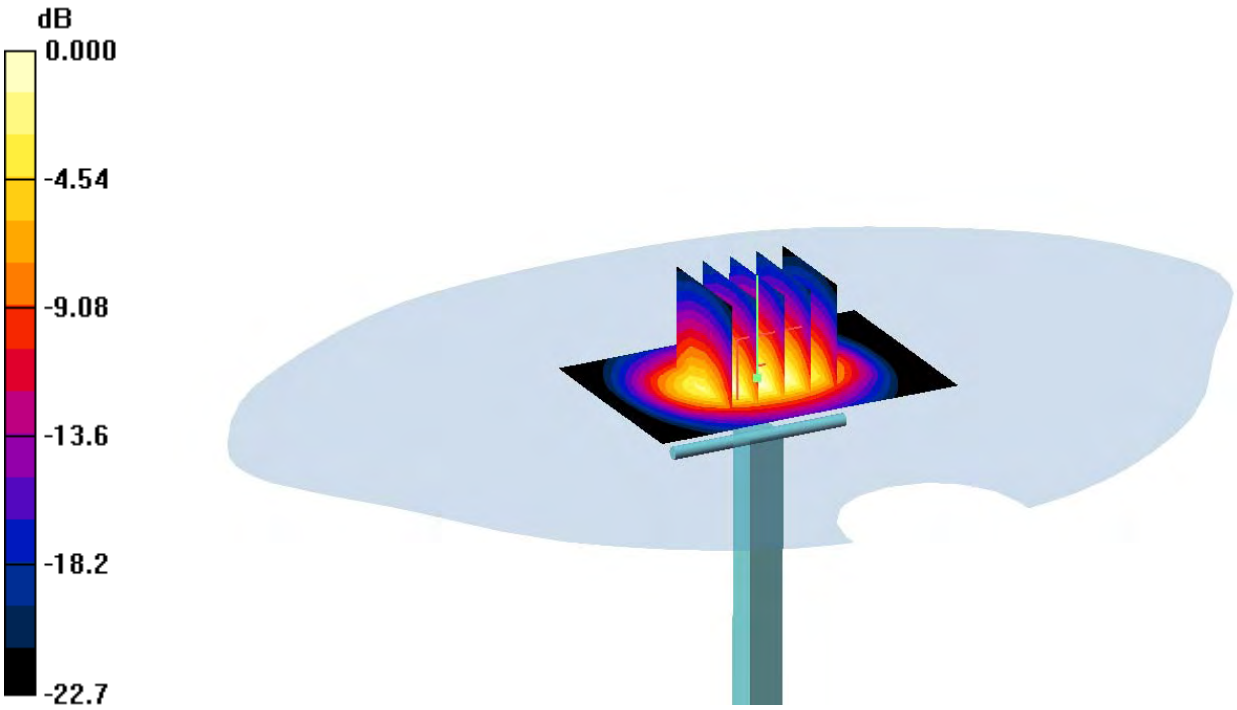
Date/Time: 2008-01-29 18:12:07

-Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
-Medium: Head 2450 MHz; σ = 1.88 mho/m; ε_r = 37.3; ρ = 1000 kg/m^3

DASY4 Configuration:
-Probe: ET3DV6 - SN1394; ConvF(4.84, 4.84, 4.84)
-Electronics: DAE3 Sn304
-Phantom: SAM 2; Serial: TP1004
-Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

d=10mm, Pin=249.8 mW/Area Scan (61x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 16.2 mW/g

d=10mm, Pin=249.8 mW/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 97.1 V/m; Power Drift = -0.072 dB
Peak SAR (extrapolated) = 30.1 W/kg
SAR(1 g) = 14.2 mW/g; SAR(10 g) = 6.57 mW/g
Maximum value of SAR (measured) = 15.9 mW/g



0 dB = 15.9mW/g

APPENDIX D: SAR distribution plots

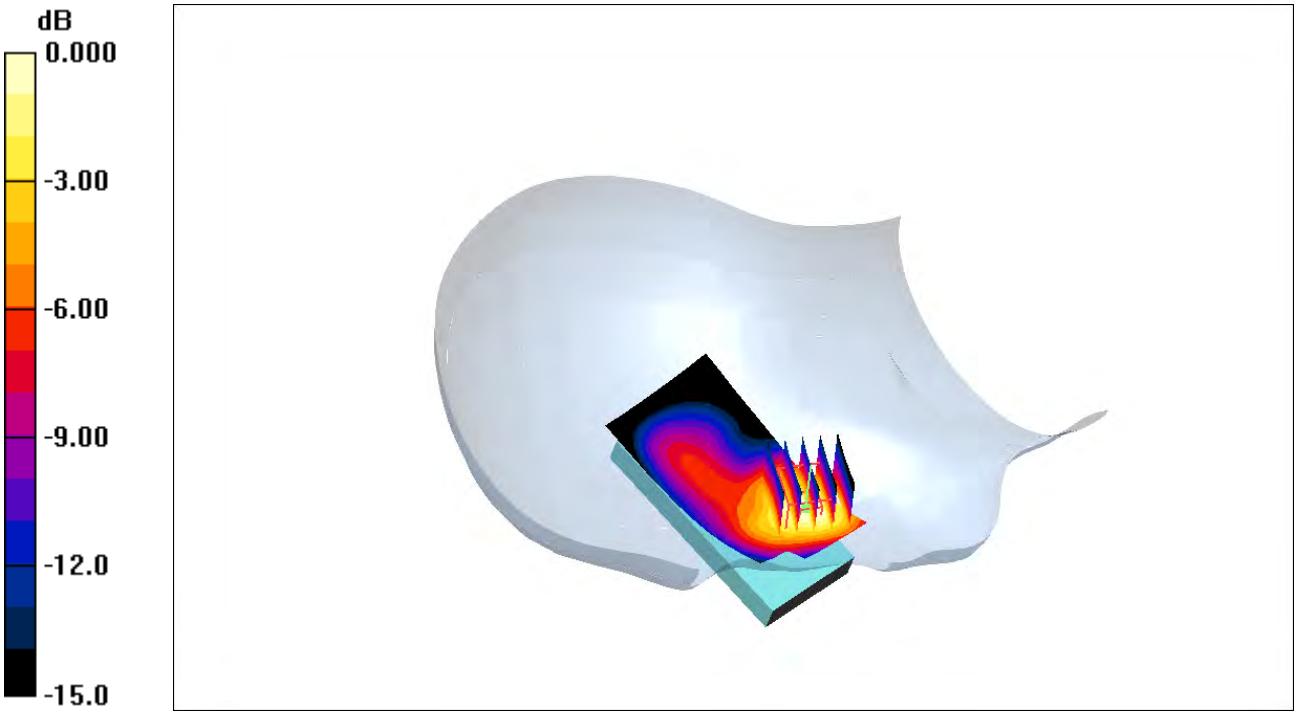
Date/Time: 2008-01-30 19:15:59

-Communication System: GSM 1900; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3
-Medium: Head 1900 MHz; σ = 1.36 mho/m; ε_r = 38.5; ρ = 1000 kg/m^3

DASY4 Configuration:
-Probe: ES3DV3 - SN3113; ConvF(4.83, 4.83, 4.83)
-Electronics: DAE3 Sn304
-Phantom: SAM 2; Serial: TP1004
-Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Cheek Ch810/Area Scan (111x61x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.57 mW/g

Cheek Ch810/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.55 V/m; Power Drift = -0.159 dB
Peak SAR (extrapolated) = 2.40 W/kg
SAR(1 g) = 1.39 mW/g; SAR(10 g) = 0.78 mW/g
Maximum value of SAR (measured) = 1.55 mW/g



0 dB = 1.55mW/g

(a) SAR Distribution for EUT in GSM1900 mode measured against the right hand side phantom for the cheek phone position.

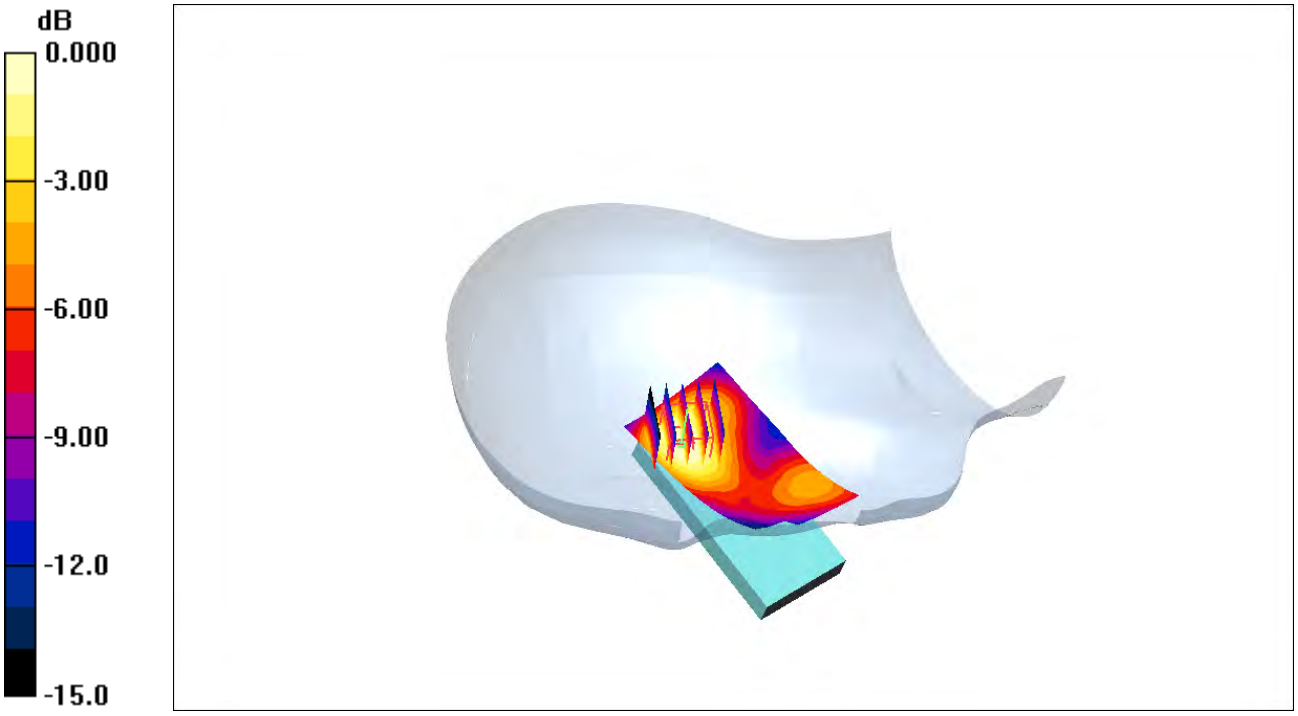
Date/Time: 2008-01-30 18:18:30

-Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
-Medium: Head 1900 MHz; σ = 1.36 mho/m; ε_r = 38.5; ρ = 1000 kg/m^3

DASY4 Configuration:
-Probe: ES3DV3 - SN3113; ConvF(4.83, 4.83, 4.83)
-Electronics: DAE3 Sn304
-Phantom: SAM 2; Serial: TP1004
-Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Tilt Ch661/Area Scan (111x61x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.394 mW/g

Tilt Ch661/Zoom Scan 2 (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.2 V/m; Power Drift = 0.041 dB
Peak SAR (extrapolated) = 0.551 W/kg
SAR(1 g) = 0.36 mW/g; SAR(10 g) = 0.23 mW/g
Maximum value of SAR (measured) = 0.396 mW/g



0 dB = 0.396mW/g

(b) SAR Distribution for EUT in GSM1900 mode measured against the right hand side phantom for the tilt phone position.

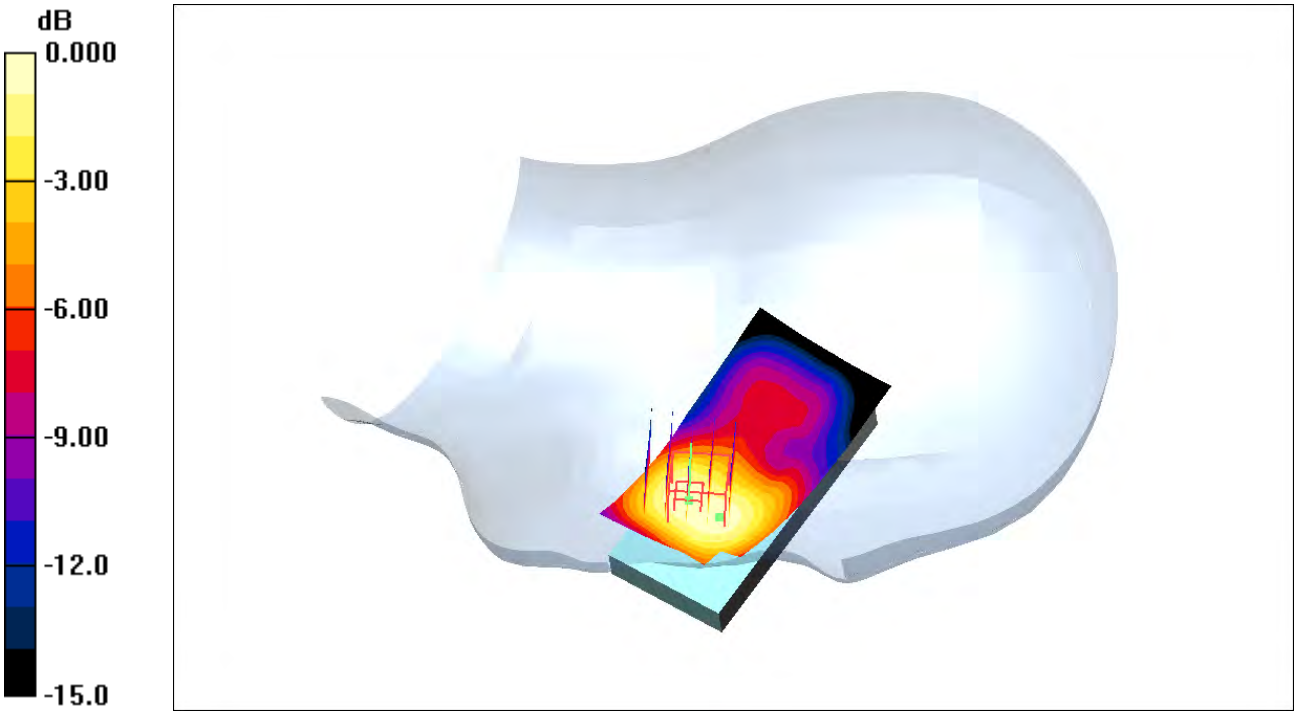
Date/Time: 2008-01-30 17:29:04

-Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
-Medium: Head 1900 MHz; σ = 1.36 mho/m; ε_r = 38.5; ρ = 1000 kg/m^3

DASY4 Configuration:
-Probe: ES3DV3 - SN3113; ConvF(4.83, 4.83, 4.83)
-Electronics: DAE3 Sn304
-Phantom: SAM 2; Serial: TP1004
-Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Cheek Ch661/Area Scan (111x61x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.833 mW/g

Cheek Ch661/Zoom Scan 2 (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.67 V/m; Power Drift = -0.016 dB
Peak SAR (extrapolated) = 1.12 W/kg
SAR(1 g) = 0.74 mW/g; SAR(10 g) = 0.48 mW/g
Maximum value of SAR (measured) = 0.809 mW/g



0 dB = 0.809mW/g

(c) SAR Distribution for EUT in GSM1900 mode measured against the left hand side phantom for the cheek phone position.

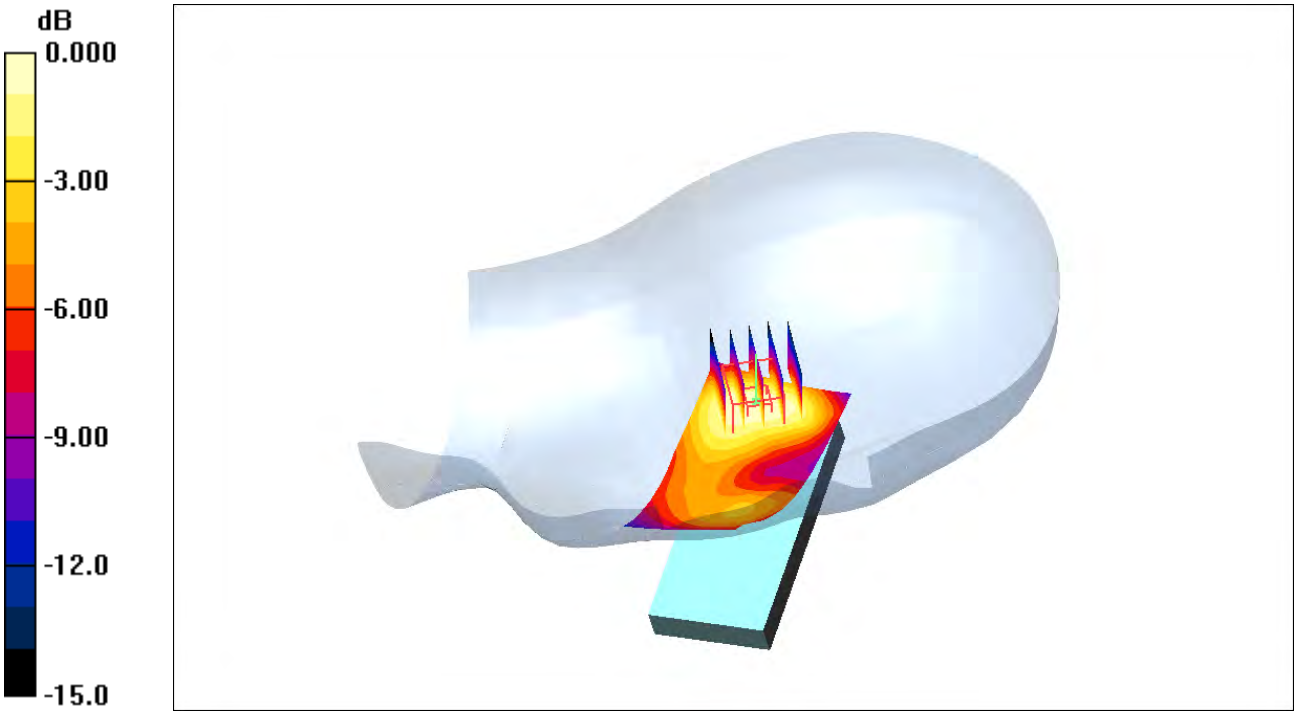
Date/Time: 2008-01-30 17:52:56

-Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
-Medium: Head 1900 MHz; σ = 1.36 mho/m; ε_r = 38.5; ρ = 1000 kg/m^3

DASY4 Configuration:
-Probe: ES3DV3 - SN3113; ConvF(4.83, 4.83, 4.83)
-Electronics: DAE3 Sn304
-Phantom: SAM 2; Serial: TP1004
-Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Tilt Ch661/Area Scan (111x61x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.293 mW/g

Tilt Ch661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.1 V/m; Power Drift = 0.030 dB
Peak SAR (extrapolated) = 0.391 W/kg
SAR(1 g) = 0.26 mW/g; SAR(10 g) = 0.17 mW/g
Maximum value of SAR (measured) = 0.285 mW/g



0 dB = 0.285mW/g

(d) SAR Distribution for EUT in GSM1900 mode measured against the left hand side phantom for the tilt phone position.

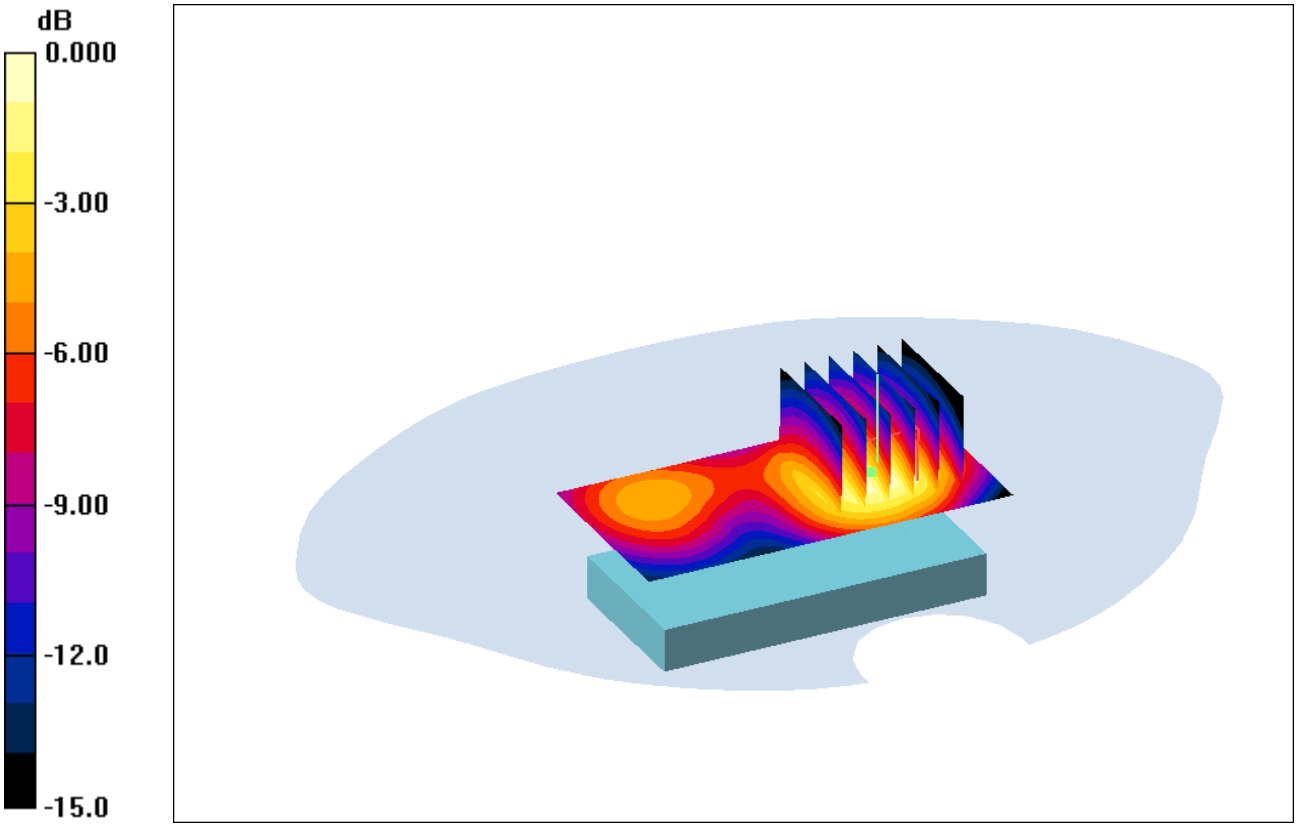
Date/Time: 2008-02-03 09:53:38

-Communication System: GSM 1900; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3
-Medium: Body 1900 MHz; σ = 1.59 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3

DASY4 Configuration:
-Probe: ES3DV3 - SN3113; ConvF(4.71, 4.71, 4.71)
-Electronics: DAE3 Sn304
-Phantom: SAM 2; Serial: TP1004
-Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Back 15mm Ch810 Bluetooth No HF/Area Scan (121x61x1): Measurement grid:
dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.801 mW/g

Back 15mm Ch810 Bluetooth No HF/Zoom Scan (6x6x7)/Cube 0: Measurement grid:
dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.2 V/m; Power Drift = -0.083 dB
Peak SAR (extrapolated) = 1.19 W/kg
SAR(1 g) = 0.73 mW/g; SAR(10 g) = 0.43 mW/g
Maximum value of SAR (measured) = 0.749 mW/g



0 dB = 0.749mW/g

(e) Maximum SAR Distribution for EUT in GSM1900 mode measured with the back of the phone facing the flat section of phantom.

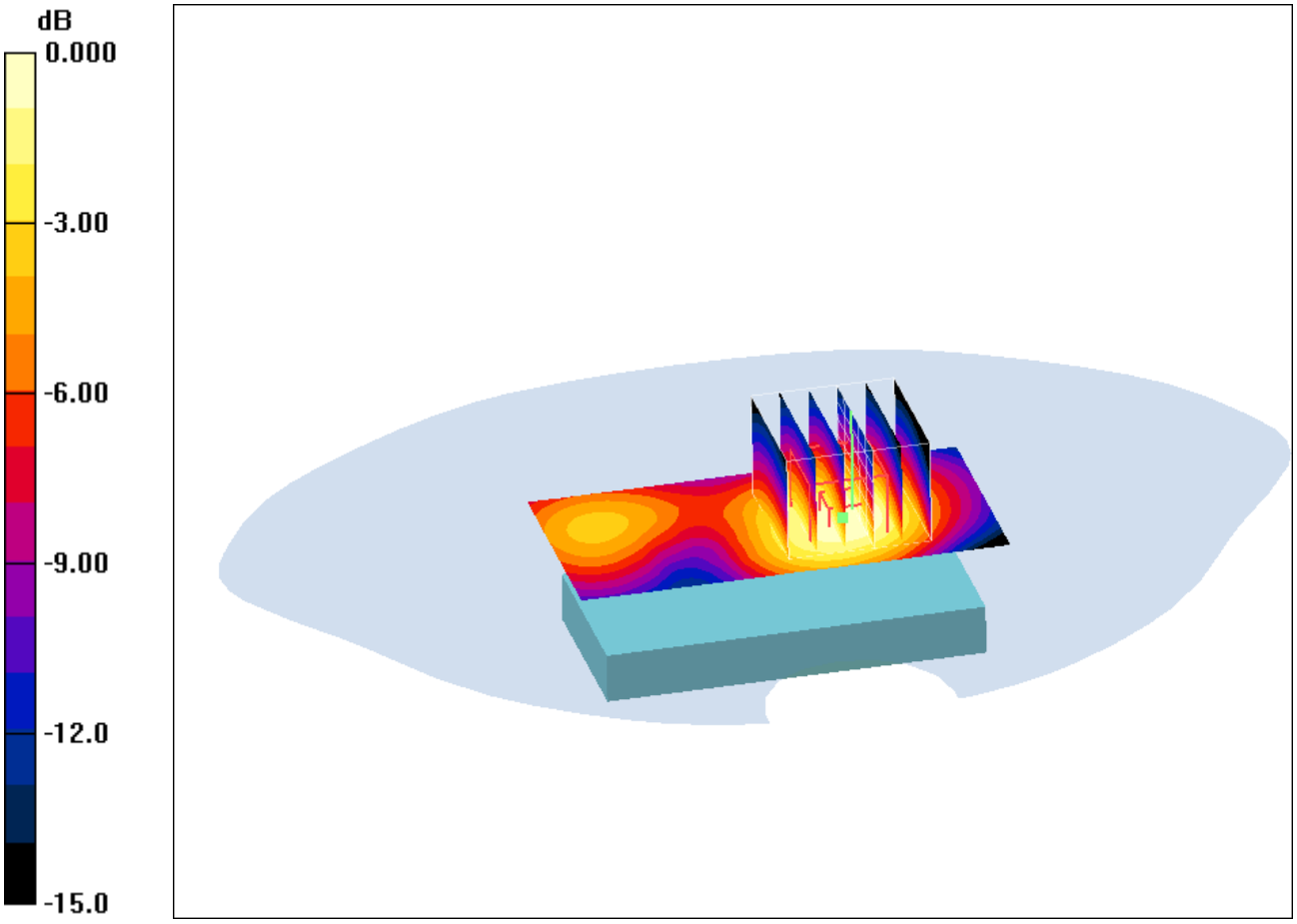
Date/Time: 2008-02-04 10:10:24

-Communication System: GPRS 1900 (2ts); Frequency: 1909.8 MHz; Duty Cycle: 1:4.15
-Medium: Body 1900 MHz; σ = 1.59 mho/m; ε_r = 51.5; ρ = 1000 kg/m^3

DASY4 Configuration:
-Probe: ES3DV3 - SN3113; ConvF(4.71, 4.71, 4.71)
-Electronics: DAE3 Sn304
-Phantom: SAM 2; ; Serial: TP1004
-Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Back 15mm Ch810 Bluetooth No HF/Area Scan (121x61x1): Measurement grid:
dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.33 mW/g

Back 15mm Ch810 Bluetooth No HF/Zoom Scan (6x6x7)/Cube 0: Measurement grid:
dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.1 V/m; Power Drift = -0.154 dB
Peak SAR (extrapolated) = 2.00 W/kg
SAR(1 g) = 1.2 mW/g; SAR(10 g) = 0.72 mW/g
Maximum value of SAR (measured) = 1.25 mW/g



0 dB = 1.25mW/g

(f) Maximum SAR Distribution for EUT in GPRS(2TS)1900 mode measured with the back of the phone facing the flat section of phantom.

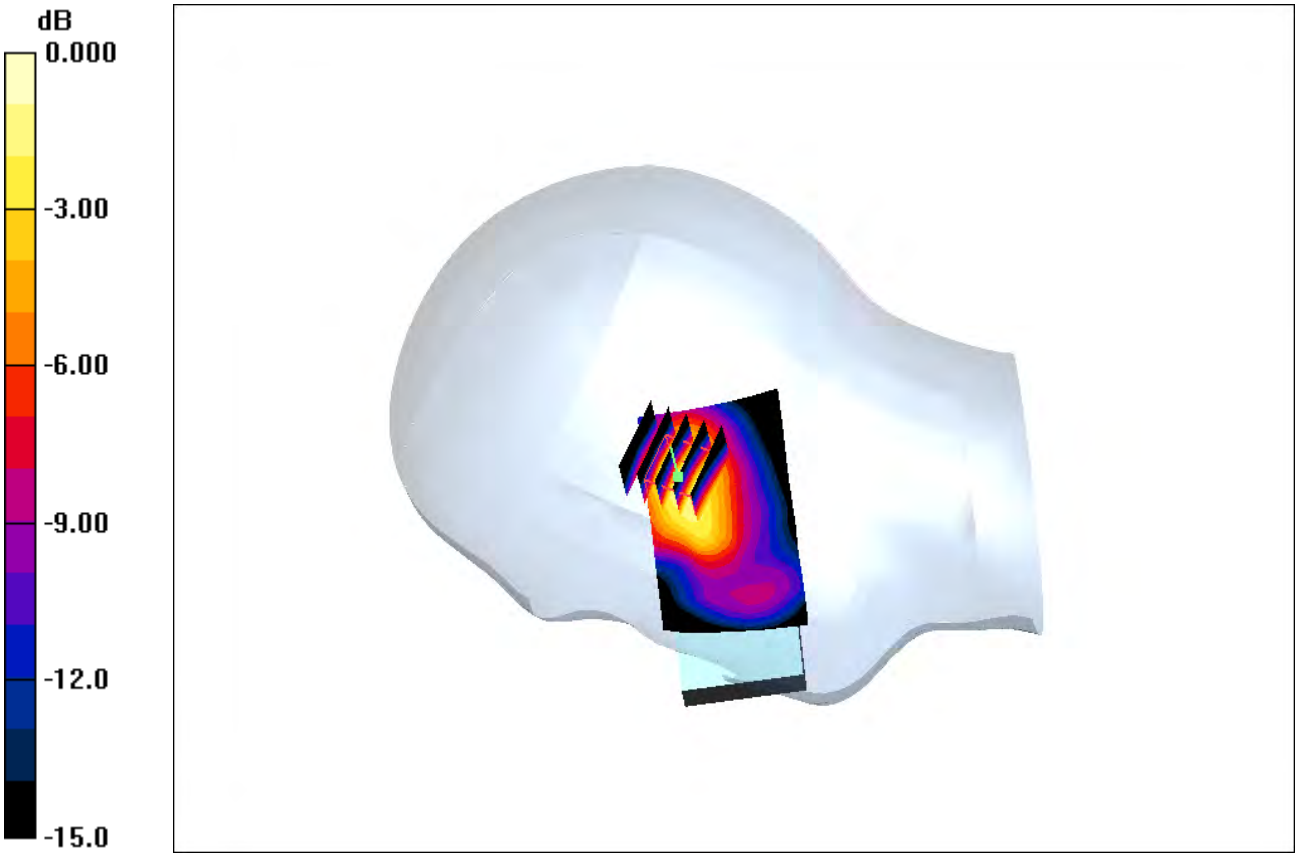
Date/Time: 2008-01-29 20:53:16

-Communication System: WLAN 2400 Burst Mode 1Mbit/s; Frequency: 2412 MHz; Duty Cycle: 1:1.66
-Medium: Head 2450 MHz; σ = 1.88 mho/m; ε_r = 37.3; ρ = 1000 kg/m^3

DASY4 Configuration:
-Probe: ET3DV6 - SN1394; ConvF(4.84, 4.84, 4.84)
-Electronics: DAE3 Sn304
-Phantom: SAM 2; Serial: TP1004
-Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Cheek Ch1/Area Scan (111x61x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.350 mW/g

Cheek Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.02 V/m; Power Drift = -0.019 dB
Peak SAR (extrapolated) = 0.687 W/kg
SAR(1 g) = 0.33 mW/g; SAR(10 g) = 0.16 mW/g
Maximum value of SAR (measured) = 0.389 mW/g



0 dB = 0.389mW/g

(g) SAR Distribution for EUT in WLAN mode measured against the right hand side phantom for the cheek phone position.

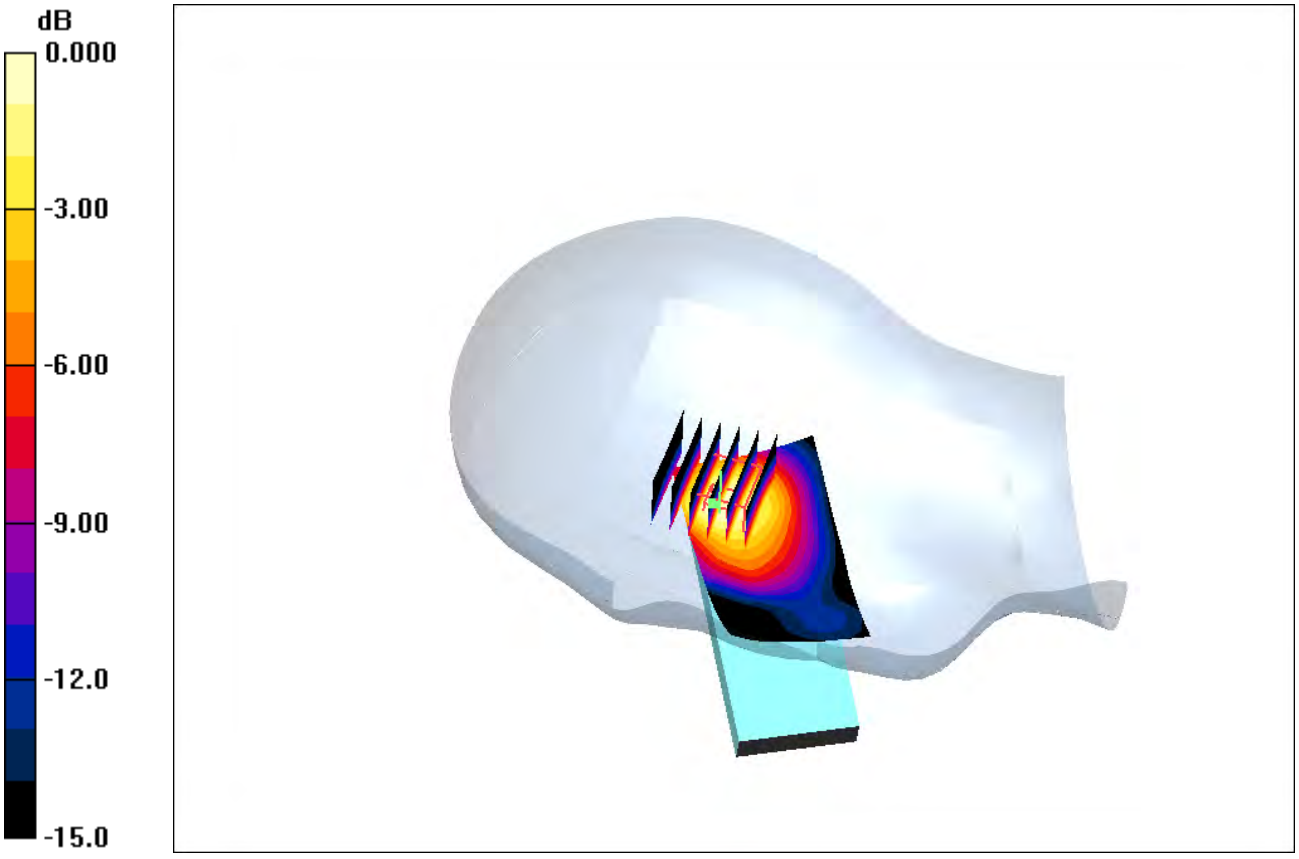
Date/Time: 2008-01-29 19:49:18

-Communication System: WLAN 2400 Burst Mode 1Mbit/s; Frequency: 2437 MHz; Duty Cycle: 1:1.66
-Medium: Head 2450 MHz; σ = 1.88 mho/m; ε_r = 37.3; ρ = 1000 kg/m^3

DASY4 Configuration:
-Probe: ET3DV6 - SN1394; ConvF(4.84, 4.84, 4.84)
-Electronics: DAE3 Sn304
-Phantom: SAM 2; Serial: TP1004
-Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Tilt Ch6/Area Scan (111x61x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.261 mW/g

Tilt Ch6/Zoom Scan 2 (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.4 V/m; Power Drift = -0.021 dB
Peak SAR (extrapolated) = 0.523 W/kg
SAR(1 g) = 0.25 mW/g; SAR(10 g) = 0.13 mW/g
Maximum value of SAR (measured) = 0.258 mW/g



0 dB = 0.258mW/g

(h) SAR Distribution for EUT in WLAN mode measured against the right hand side phantom for the tilt phone position.

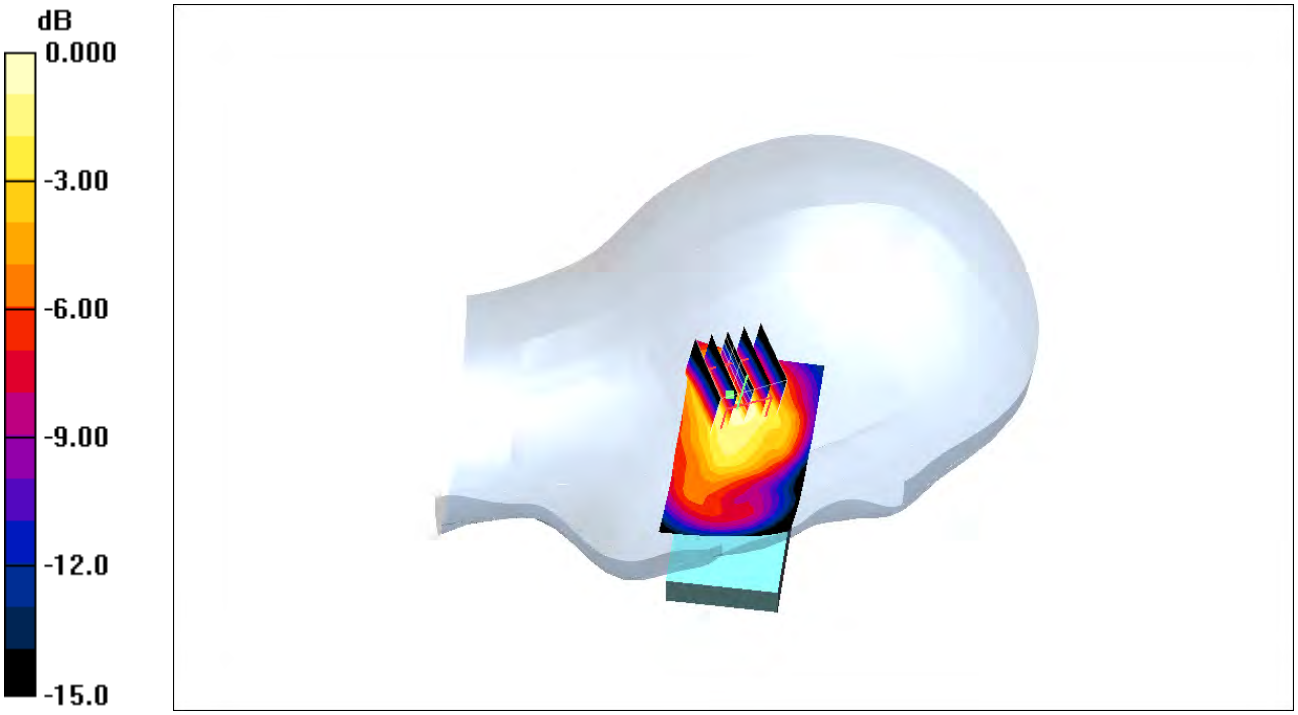
Date/Time: 2008-01-29 18:53:15

-Communication System: WLAN 2400 Burst Mode 1Mbit/s; Frequency: 2437 MHz; Duty Cycle: 1:1.66
-Medium: Head 2450 MHz; σ = 1.88 mho/m; ε_r = 37.3; ρ = 1000 kg/m^3

DASY4 Configuration:
-Probe: ET3DV6 - SN1394; ConvF(4.84, 4.84, 4.84)
-Electronics: DAE3 Sn304
-Phantom: SAM 2; Serial: TP1004
-Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Cheek Ch6/Area Scan (111x61x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.221 mW/g

Cheek Ch6/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.64 V/m; Power Drift = 0.195 dB
Peak SAR (extrapolated) = 0.389 W/kg
SAR(1 g) = 0.21 mW/g; SAR(10 g) = 0.12 mW/g
Maximum value of SAR (measured) = 0.228 mW/g



0 dB = 0.228mW/g

(i) SAR Distribution for EUT in WLAN mode measured against the left hand side phantom for the cheek phone position.

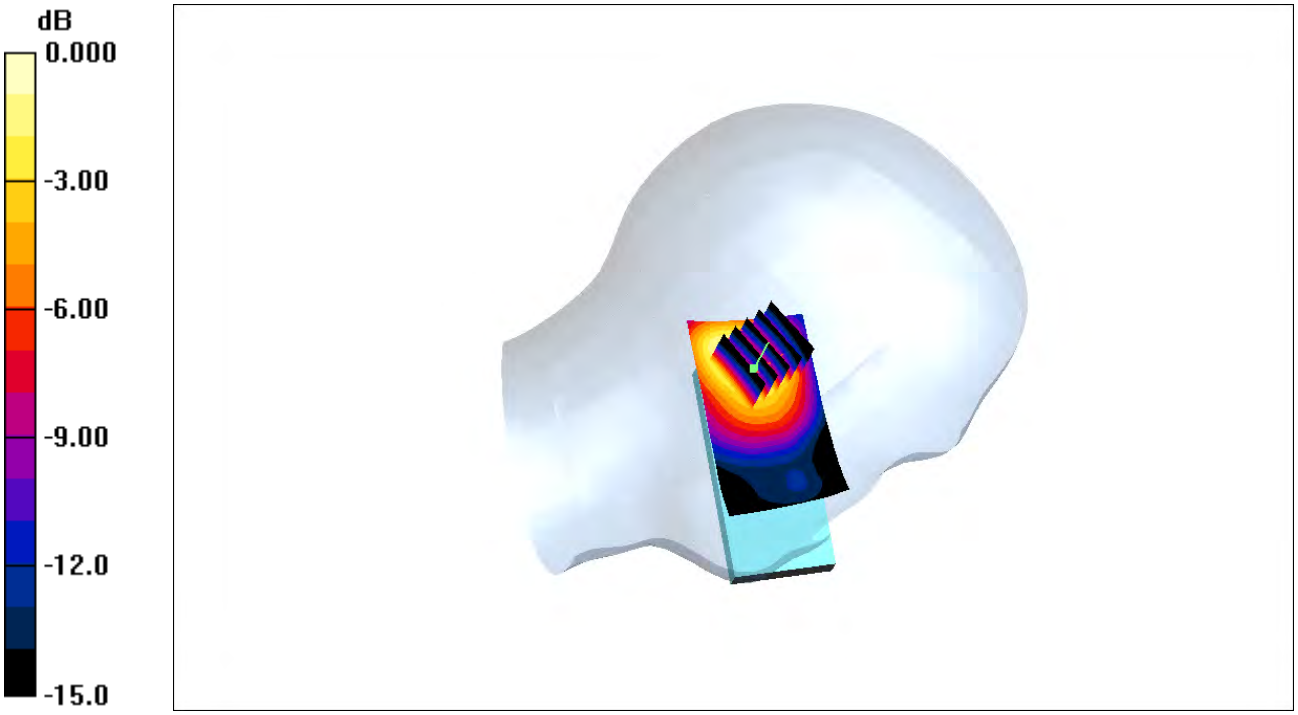
Date/Time: 2008-01-29 19:11:17

-Communication System: WLAN 2400 Burst Mode 1Mbit/s; Frequency: 2437 MHz; Duty Cycle: 1:1.66
-Medium: Head 2450 MHz; σ = 1.88 mho/m; ε_r = 37.3; ρ = 1000 kg/m^3

DASY4 Configuration:
-Probe: ET3DV6 - SN1394; ConvF(4.84, 4.84, 4.84)
-Electronics: DAE3 Sn304
-Phantom: SAM 2; Serial: TP1004
-Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Tilt Ch6/Area Scan (111x61x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.211 mW/g

Tilt Ch6/Zoom Scan 2 (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.0 V/m; Power Drift = -0.021 dB
Peak SAR (extrapolated) = 0.353 W/kg
SAR(1 g) = 0.19 mW/g; SAR(10 g) = 0.11 mW/g
Maximum value of SAR (measured) = 0.213 mW/g



0 dB = 0.213mW/g

(j) SAR Distribution for EUT in WLAN mode measured against the left hand side phantom for the tilt phone position.

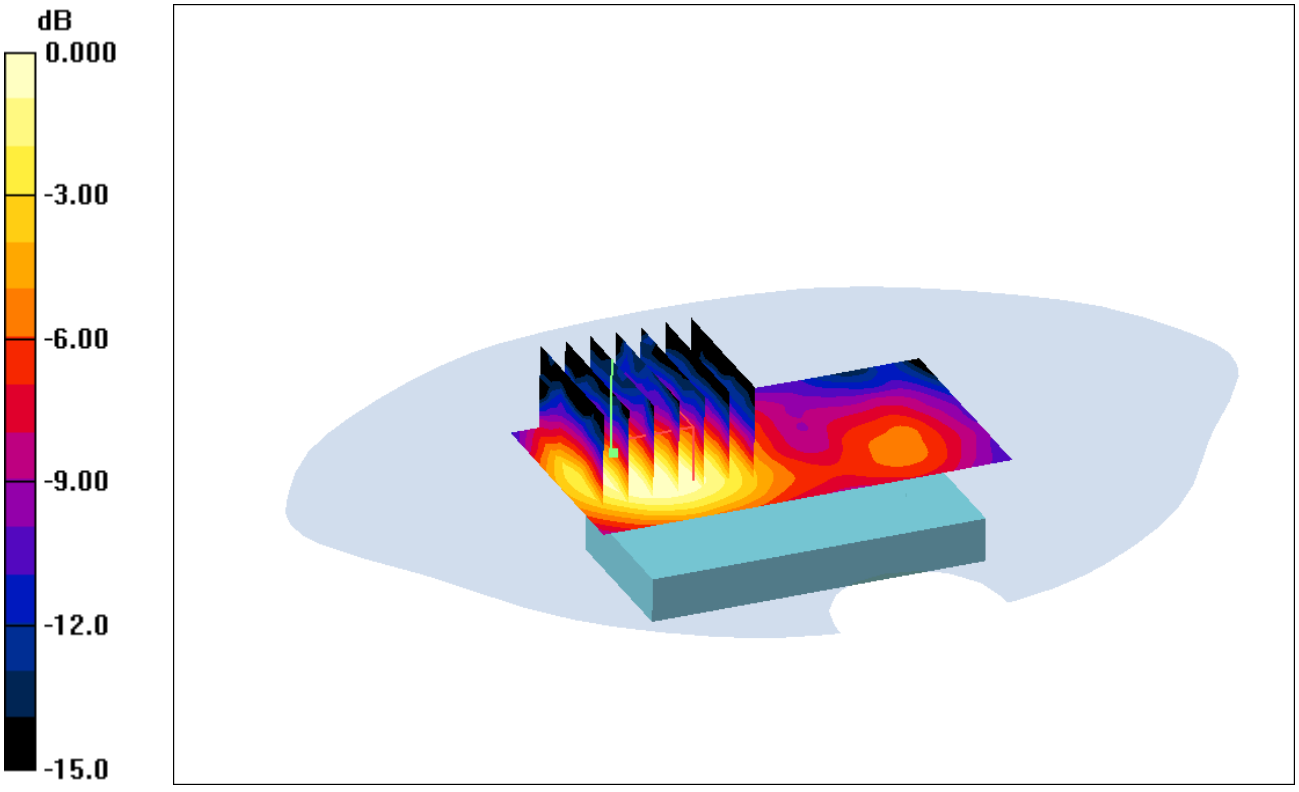
Date/Time: 2008-01-28 13:19:34

-Communication System: WLAN 2400 Burst Mode 1Mbit/s; Frequency: 2412 MHz; Duty Cycle: 1:1.66
-Medium: Body 2450 MHz; σ = 2.04 mho/m; ε_r = 50.5; ρ = 1000 kg/m^3

DASY4 Configuration:
-Probe: ES3DV3 - SN3113; ConvF(4.02, 4.02, 4.02)
-Electronics: DAE3 Sn422
-Phantom: SAM 2; Serial: TP1004
-Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Back 15mm Ch1 No HF/Area Scan (131x71x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.099 mW/g

Back 15mm Ch1 No HF/Zoom Scan 2 (7x7x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.94 V/m; Power Drift = -0.020 dB
Peak SAR (extrapolated) = 0.173 W/kg
SAR(1 g) = 0.09 mW/g; SAR(10 g) = 0.05 mW/g
Maximum value of SAR (measured) = 0.095 mW/g



0 dB = 0.095mW/g

(k) Maximum SAR Distribution for EUT in WLAN mode measured with the back of the phone facing the flat section of phantom.

APPENDIX E: Probe calibration parameters for ES3DV3, S/N: 3113

Diode compression:

Parameter	Value in mV
DCP X	97
DCP Y	97
DCP Z	96

Sensitivity in free space:

Parameter	Value in $\mu V/(V/m)^2$
Norm X	1.18
Norm Y	1.12
Norm Z	1.27

Sensitivity in tissue simulating liquid

Head 1900 MHz; ε_r=40 ± 5%, σ=1.40± 5% S/m.

Parameter	Value
ConvF X	4.83
ConvF Y	4.83
ConvF Z	4.83

Muscle 1900 MHz; ε_r=53.3 ± 5%, σ=1.52± 5% S/m.

Parameter	Value
ConvF X	4.71
ConvF Y	4.71
ConvF Z	4.71

Muscle 2450 MHz; ε_r=52.7 ± 5%, σ=1.95± 5% S/m.

Parameter	Value
ConvF X	4.02
ConvF Y	4.02
ConvF Z	4.02

Probe tip to sensor center: 2.0 mm

APPENDIX F: Probe calibration parameters for ET3DV6, S/N: 1394

Diode compression:

Parameter	Value in mV
DCP X	94
DCP Y	93
DCP Z	92

Sensitivity in free space:

Parameter	Value in $\mu V/(V/m)^2$
Norm X	1.79
Norm Y	2.01
Norm Z	1.74

Sensitivity in tissue simulating liquid

Head 2450 MHz; ε_r=39.2 ± 5%, σ=1.80± 5% S/m.

Parameter	Value
ConvF X	4.84
ConvF Y	4.84
ConvF Z	4.84

Probe tip to sensor center: 2.7 mm