

SAR Compliance Test Report

Test report no.:	Salo_SAR_0824_06	Date of report:	2008-06-18
Template version:	9.0	Number of pages:	103
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Tested device:	RM-333		
FCC ID:	QURRM-333	IC:	661AC-RM333
Supplement reports:	Salo_SAR_0825_01		
Testing has been carried out in accordance with:	47CFR §2.1093 Radiofrequency Radiation Exposure Evaluation: Portable Devices FCC OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01) Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields RSS-102 Evaluation Procedure for Mobile and Portable Radio Transmitters with Respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields IEEE 1528 - 2003 IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Technique		
Documentation:	The documentation of the testing performed on the tested devices is archived for 15 years at TCC Nokia.		
Test results:	The tested device complies with the requirements in respect of all parameters subject to the test. The test results and statements relate only to the items tested. The test report shall not be reproduced except in full, without written approval of the laboratory.		
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1. SUMMARY OF SAR TEST REPORT

1.1 Test Details

Period of test	2008-05-20 to 2008-06-11
SN, HW and SW numbers of tested device	SN: 004401/10/102304/8, HW: 1004, SW: 0.35, DUT: 12828
Batteries used in testing	BL-5K, DUT: 12829,12830,12831,12832,12833,12834
Headsets used in testing	HS-45 + AD-54, DUT: 12836, 12835
Other accessories used in testing	-
State of sample	Prototype unit
Notes	-

1.2 Maximum Results

The maximum measured SAR values for Head configuration and Body Worn configuration are given in section 1.2.1 and 1.2.2 respectively. The device conforms to the requirements of the standard(s) when the maximum measured SAR value is less than or equal to the limit.

1.2.1 Head Configuration

Mode	Ch / f (MHz)	Radiated power	Position	Measured SAR value (1g avg)	Scaled* SAR value (1g avg)	SAR limit (1g avg)	Result
2-slot GPRS850	190 / 836.6	28.6 dBm ERP	Right, Cheek	0.916 W/kg	1.03 W/kg	1.6 W/kg	PASSED
2-slot GPRS1900	810 / 1909.8	28.0 dBm EIRP	Left, Cheek	0.901 W/kg	1.01 W/kg	1.6 W/kg	PASSED
WCDMA 1900	9538 / 1907.6	22.0 dBm EIRP	Left, Cheek	0.651 W/kg	0.73 W/kg	1.6 W/kg	PASSED
WLAN 2450	1 / 2412.0	20.9 dBm EIRP	Right, Tilt	0.159 W/kg	0.18 W/kg	1.6 W/kg	PASSED
2-slot GPRS850 + WLAN 2450	-	-	Right, Cheek	1.003 W/kg	1.12 W/kg	1.6W/kg	PASSED
2-slot GPRS1900 + WLAN 2450	-	-	Left, Cheek	0.894 W/kg	1.00 W/kg	1.6 W/kg	PASSED
WCDMA 1900 + WLAN 2450	-	-	Left, Cheek	0.715 W/kg	0.80 W/kg	1.6 W/kg	PASSED

1.2.2 Body Worn Configuration

Mode	Ch / f (MHz)	Radiated power	Separation distance	Measured SAR value (1g avg)	Scaled* SAR value (1g avg)	SAR limit (1g avg)	Result
2-slot GPRS850	190 / 836.6	25.3 dBm ERP	1.5 cm	0.707 W/kg	0.79 W/kg	1.6 W/kg	PASSED
2-slot GPRS1900	810 / 1909.8	28.0 dBm EIRP	1.5 cm	0.555 W/kg	0.62 W/kg	1.6 W/kg	PASSED
WCDMA 1900	9538 / 1907.6	22.0 dBm EIRP	1.5 cm	0.567 W/kg	0.64 W/kg	1.6 W/kg	PASSED
WLAN 2450	7 / 2442.0	23.5 dBm EIRP	1.5 cm	0.069 W/kg	0.08 W/kg	1.6 W/kg	PASSED
2-slot GPRS850 + WLAN 2450	-	-	1.5 cm	0.773 W/kg	0.87 W/kg	1.6 W/kg	PASSED
2-slot GPRS1900 + WLAN 2450	-	-	1.5 cm	0.621 W/kg	0.70 W/kg	1.6 W/kg	PASSED
WCDMA 1900 + WLAN 2450	-	-	1.5 cm	0.633 W/kg	0.71 W/kg	1.6 W/kg	PASSED

*SAR values are scaled up by 12% to cover measurement drift.

1.2.3 Maximum Drift

Maximum drift covered by 12% scaling up of the SAR values	Maximum drift during measurements
0.5dB	0.49dB

1.2.4 Measurement Uncertainty

Expanded Uncertainty (k=2) 95%	± 25.8%
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2. DESCRIPTION OF THE DEVICE UNDER TEST

Device category	Portable
Exposure environment	General population / uncontrolled

Modes of Operation	Bands	Modulation Mode	Duty Cycle	Transmitter Frequency Range (MHz)
GSM	850 1900	GMSK	1/8	824 – 849 1850 – 1910
GPRS	850 1900	GMSK	1/8 to 3/8	824 – 849 1850 – 1910
EGPRS	850 1900	GMSK / 8PSK	1/8 to 3/8	824 – 849 1850 – 1910
WCDMA	1900 (Band II)		1	1852 – 1908
BT	2450	GFSK	1	2402 – 2480
WLAN	2450	11Mbps QPSK	1	2412 – 2462

Outside of USA and Canada, the transmitter of the device is capable of operating also in GSM/GPRS/EGPRS900, GSM/GPRS/EGPRS1800, WCDMA900 and WCDMA2100 bands which are not part of this filing.

This device has Push to Talk/Voice-over-IP/Dual Transfer Mode capability for use at the ear. Therefore, SAR for multi slot GPRS mode was evaluated against the head profile of the phantom.

2.1 Description of the Antenna

The device has internal antennas.

3. TEST CONDITIONS

3.1 Temperature and Humidity

Ambient temperature (°C):	20.1 to 22.4
Ambient humidity (RH %):	32 to 53

3.2 Test Signal, Frequencies and Output Power

The device was put into operation by using .

The device output power was set to maximum power level for all tests; a fully charged battery was used for every test sequence.

The transmission mode of the device in all WCDMA tests was configured to 12.2kbps RMC with all TPC bits set as “1”.

In all operating bands the measurements were performed on lowest, middle and highest channels.

The radiated output power of the device was measured by a separate test laboratory on the same unit(s) as used for SAR testing.

4. DESCRIPTION OF THE TEST EQUIPMENT

4.1 Measurement System and Components

The measurements were performed using an automated near-field scanning system, DASY4, manufactured by Schmid & Partner Engineering AG (SPEAG) in Switzerland. The SAR extrapolation algorithm used in all measurements was the 'advanced extrapolation' algorithm.

The following table lists calibration dates of SPEAG components:

Test Equipment	Serial Number	Calibration interval	Calibration expiry
DAE 4	728	12 months	2009-04
DAE 4	538	12 months	2008-07
E-field Probe ET3DV6	1395	12 months	2008-07
E-field Probe ET3DV6	1766	12 months	2008-10
E-field Probe ES3DV3	3131	12 months	2009-04
Dipole Validation Kit, D835V2	480	24 months	2009-05
Dipole Validation Kit, D1900V2	5d013	24 months	2008-07
Dipole Validation Kit, D2450V2	729	24 months	2010-01
DASY4 software	Version 4.7	-	-

Additional test equipment used in testing:

Test Equipment	Model	Serial Number	Calibration interval	Calibration expiry
Signal Generator	SML03	101265	12 months	2008-07
Amplifier	ZHL-42 (SMA)	N072095-5	12 months	2008-07
Power Meter	NRVS	849305/028	12 months	2008-07
Power Sensor	NRV-Z32	839176/020	12 months	2008-07
Call Tester	CMU 200	101111	-	-
Call Tester	CMU 200	103293	-	-
Call Tester	CMU 200	100084	-	-
Vector Network Analyzer	8753E	US38432928	12 months	2008-07
Dielectric Probe Kit	85070B	US33020420	-	-

4.1.1 Isotropic E-field Probe Type ET3DV6

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection system Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., butyl diglycol)
Calibration	Calibration certificate in Appendix C
Frequency	10 MHz to 3 GHz (dosimetry); Linearity: ± 0.2 dB (30 MHz to 3 GHz)
Optical Surface Detection	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.4 dB in HSL (rotation normal to probe axis)
Dynamic Range	5 μ W/g to > 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm Tip length: 16 mm Body diameter: 12 mm Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm
Application	General dosimetry up to 3 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

4.1.2 Isotropic E-field Probe Type ES3DV3

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., butyl diglycol)
Calibration	Calibration certificate in Appendix C
Frequency	10 MHz to 4 GHz (dosimetry); Linearity: ± 0.2 dB (30 MHz to 4 GHz)
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.3 dB in HSL (rotation normal to probe axis)
Dynamic Range	5 μ W/g to > 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm Tip length: 20 mm Body diameter: 12 mm Tip diameter: 3.9 mm Distance from probe tip to dipole centers: 2.0 mm
Application	General dosimetry up to 4 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

4.2 Phantoms

The phantom used for all tests i.e. for both system checks and device testing, was the twin-headed "SAM Phantom", manufactured by SPEAG. The phantom conforms to the requirements of IEEE 1528 - 2003.

System checking was performed using the flat section, whilst Head SAR tests used the left and right head profile sections. Body SAR testing also used the flat section between the head profiles.

The SPEAG device holder (see Section 5.1) was used to position the device in all tests whilst a tripod was used to position the validation dipoles against the flat section of phantom.

4.3 Tissue Simulants

Recommended values for the dielectric parameters of the tissue simulants are given in IEEE 1528 - 2003 and FCC Supplement C to OET Bulletin 65. All tests were carried out using simulants whose dielectric parameters were within $\pm 5\%$ of the recommended values. All tests were carried out within 24 hours of measuring the dielectric parameters.

The depth of the tissue simulant was 15.0 ± 0.5 cm measured from the ear reference point during system checking and device measurements.

4.3.1 Tissue Simulant Recipes

The following recipe(s) were used for Head and Body tissue simulant(s):

800MHz band

Ingredient	Head (% by weight)	Body (% by weight)
Deionised Water	51.50	69.25
Tween 20	47.35	30.00
Salt	1.15	0.75

1900MHz band

Ingredient	Head (% by weight)	Body (% by weight)
Deionised Water	54.50	70.25
Tween 20	45.23	29.41
Salt	0.27	0.34

2450MHz band

Ingredient	Head (% by weight)	Body (% by weight)
Deionised Water	56.0	70.20
Tween 20	44.0	29.62
Salt	-	0.18

4.3.2 System Checking

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulants were measured every day using the dielectric probe kit and the network analyser. A system check measurement was made following the determination of the dielectric parameters of the simulant, using the dipole validation kit. A power level of 250 mW was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom. The system checking results (dielectric parameters and SAR values) are given in the table below.

System checking, head tissue simulant

f [MHz]	Description	SAR [W/kg], 1g	Dielectric Parameters		Temp [°C]
			ϵ_r	σ [S/m]	
835	Reference result	2.29	41.6	0.90	
	$\pm 10\%$ window	2.06 – 2.52			
	2008-06-04	2.29	41.3	0.91	21.0
	2008-06-05	2.32	41.5	0.91	21.0
	2008-06-06	2.31	41.4	0.91	21.0
1900	Reference result	9.69	39.3	1.44	
	$\pm 10\%$ window	8.72 – 10.66			
	2008-05-20	10.4	39.1	1.45	21.0
	2008-06-02	9.76	39.0	1.39	21.0
	2008-06-05	10.1	38.7	1.41	21.0
2450	Reference result	14.3	37.8	1.82	
	$\pm 10\%$ window	12.9 – 15.7			
	2008-06-10	14.6	39.2	1.85	21.0

System checking, body tissue simulant

f [MHz]	Description	SAR [W/kg], 1g	Dielectric Parameters		Temp [°C]
			ϵ_r	σ [S/m]	
1900	Reference result	10.1	52.3	1.57	
	± 10% window	9.1 – 11.1			
	2008-05-22	9.75	51.7	1.53	21.0
2450	Reference result	13.8	52.5	1.99	
	± 10% window	12.4 – 15.2			
	2008-06-11	14.6	50.6	2.03	21.0

Plots of the system checking scans are given in Appendix A.

4.3.3 Tissue Simulants used in the Measurements

Head tissue simulant measurements

f [MHz]	Description	Dielectric Parameters		Temp [°C]
		ϵ_r	σ [S/m]	
836	Recommended value	41.5	0.90	
	± 5% window	39.4 – 43.6	0.86 – 0.95	
	2008-06-04	41.3	0.91	21.0
	2008-06-05	41.5	0.91	21.0
	2008-06-06	41.5	0.91	21.0
1880	Recommended value	40.0	1.40	
	± 5% window	38.0 – 42.0	1.33 – 1.47	
	2008-05-20	39.1	1.43	21.0
	2008-06-02	39.1	1.37	21.0
	2008-06-05	38.8	1.39	21.0
2442	Recommended value	39.2	1.79	
	± 5% window	37.3 – 41.2	1.70 – 1.88	
	2008-06-10	39.3	1.84	21.0

Body tissue simulant measurements

f [MHz]	Description	Dielectric Parameters		Temp [°C]
		ϵ_r	σ [S/m]	
836	Recommended value	55.2	0.97	21.0
	± 5% window	52.4 – 58.0	0.92 – 1.02	
	2008-06-05	54.4	0.99	
1880	Recommended value	53.3	1.52	21.0
	± 5% window	50.6 – 56.0	1.44 – 1.60	
	2008-05-22	51.7	1.51	
	2008-06-02	51.6	1.49	
2442	Recommended value	52.7	1.94	21.0
	± 5% window	50.1 – 55.3	1.85 – 2.04	
	2008-06-11	50.6	2.02	

5. DESCRIPTION OF THE TEST PROCEDURE

5.1 Device Holder

The device was placed in the device holder (illustrated below) that is supplied by SPEAG as an integral part of the Dasy system.



Device holder supplied by SPEAG

A Nokia designed spacer (illustrated below) was used to position the device within the SPEAG holder. The spacer positions the device so that the holder has minimal effect on the test results but still holds the device securely. The spacer was removed before the tests.



Nokia spacer

5.2 Scan Procedures

First, area scans were used for determination of the field distribution. Next, a zoom scan, a minimum of 5x5x7 points covering a volume of at least 30x30x30mm, was performed around the highest E-field value to determine the averaged SAR value. Drift was determined by measuring the same point at the start of the area scan and again at the end of the zoom scan.

5.3 SAR Averaging Methods

The maximum SAR value was averaged over a cube of tissue using interpolation and extrapolation.

The interpolation, extrapolation and maximum search routines within Dasy4 are all based on the modified Quadratic Shepard's method (Robert J. Renka, "Multivariate Interpolation Of Large Sets Of Scattered Data", University of North Texas ACM Transactions on Mathematical Software, vol. 14, no. 2, June 1988, pp. 139-148).

The interpolation scheme combines a least-square fitted function method with a weighted average method. A trivariate 3-D / bivariate 2-D quadratic function is computed for each measurement point and fitted to neighbouring points by a least-square method. For the zoom scan, inverse distance weighting is incorporated to fit distant points more accurately. The interpolating function is finally calculated as a weighted average of the quadratics.

In the zoom scan, the interpolation function is used to extrapolate the Peak SAR from the deepest measurement points to the inner surface of the phantom.

6. MEASUREMENT UNCERTAINTY

Table 6.1 – Measurement uncertainty evaluation

Uncertainty Component	Section in IEEE 1528	Tol. (%)	Prob Dist	Div	C_i	$C_i \cdot U_i$ (%)	V_i
Measurement System							
Probe Calibration	E2.1	±5.9	N	1	1	±5.9	∞
Axial Isotropy	E2.2	±4.7	R	√3	$(1-c_p)^{1/2}$	±1.9	∞
Hemispherical Isotropy	E2.2	±9.6	R	√3	$(c_p)^{1/2}$	±3.9	∞
Boundary Effect	E2.3	±1.0	R	√3	1	±0.6	∞
Linearity	E2.4	±4.7	R	√3	1	±2.7	∞
System Detection Limits	E2.5	±1.0	R	√3	1	±0.6	∞
Readout Electronics	E2.6	±1.0	N	1	1	±1.0	∞
Response Time	E2.7	±0.8	R	√3	1	±0.5	∞
Integration Time	E2.8	±2.6	R	√3	1	±1.5	∞
RF Ambient Conditions - Noise	E6.1	±3.0	R	√3	1	±1.7	∞
RF Ambient Conditions - Reflections	E6.1	±3.0	R	√3	1	±1.7	∞
Probe Positioner Mechanical Tolerance	E6.2	±0.4	R	√3	1	±0.2	∞
Probe Positioning with respect to Phantom Shell	E6.3	±2.9	R	√3	1	±1.7	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	E5	±3.9	R	√3	1	±2.3	∞
Test sample Related							
Test Sample Positioning	E4.2	±6.0	N	1	1	±6.0	11
Device Holder Uncertainty	E4.1	±5.0	N	1	1	±5.0	7
Output Power Variation - SAR drift measurement	6.6.3	±0.0	R	√3	1	±0.0	∞
Phantom and Tissue Parameters							
Phantom Uncertainty (shape and thickness tolerances)	E3.1	±4.0	R	√3	1	±2.3	∞
Conductivity Target - tolerance	E3.2	±5.0	R	√3	0.64	±1.8	∞
Conductivity - measurement uncertainty	E3.3	±5.5	N	1	0.64	±3.5	5
Permittivity Target - tolerance	E3.2	±5.0	R	√3	0.6	±1.7	∞
Permittivity - measurement uncertainty	E3.3	±2.9	N	1	0.6	±1.7	5
Combined Standard Uncertainty			RSS			±12.9	116
Coverage Factor for 95%			k=2				
Expanded Uncertainty						±25.8	

7. RESULTS

The measured Head SAR values for the test device are tabulated below:

850MHz Head SAR results

Slide option	Test configuration		SAR, averaged over 1g (W/kg)		
			Ch 128 824.2 MHz	Ch 190 836.6 MHz	Ch 251 848.8 MHz
GSM	Power		25.4 dBm	25.8 dBm	24.4 dBm
Slide closed	Left	Cheek	-	0.294	-
		Tilt	-	-	-
	Right	Cheek	-	-	-
		Tilt	-	-	-
2-slot GPRS	Power		24.6 dBm	25.3 dBm	23.9 dBm
Slide closed	Left	Cheek	-	0.412	-
		Tilt	-	0.336	-
	Right	Cheek	-	0.528	-
		Tilt	-	0.390	-
2-slot GPRS	Power		27.6 dBm	28.6 dBm	27.3 dBm
Slide open	Left	Cheek	-	0.750	-
		Tilt	-	0.465	-
	Right	Cheek	0.883	0.913	0.909
		Tilt	-	0.526	-
2-slot GPRS	Power		20.5 dBm	21.2 dBm	19.9 dBm
Slide MPS	Left	Cheek	-	0.187	-
		Tilt	-	0.227	-
	Right	Cheek	-	0.257	-
		Tilt	-	0.286	-
3-slot GPRS	Power		22.8 dBm	23.3 dBm	21.8 dBm
Slide closed	Left	Cheek	-	0.398	-
		Tilt	-	-	-
	Right	Cheek	-	-	-
		Tilt	-	-	-

table continues...

Slide option	Test configuration		SAR, averaged over 1g (W/kg)		
			Ch 128 824.2 MHz	Ch 190 836.6 MHz	Ch 251 848.8 MHz
2-slot 8PSK EGPRS	Power		20.4 dBm	22.2 dBm	20.1 dBm
Slide open	Left	Cheek	-	-	-
		Tilt	-	-	-
	Right	Cheek	-	0.250	-
		Tilt	-	-	-
2-slot GPRS Slide open	Right Cheek, BT active		-	0.916	-

1900MHz Head SAR results

Slide option	Test configuration		SAR, averaged over 1g (W/kg)		
			Ch 512 1850.2 MHz	Ch 661 1880.0 MHz	Ch 810 1909.8 MHz
GSM	Power		28.6 dBm	30.0 dBm	27.9 dBm
Slide closed	Left	Cheek	-	0.397	-
		Tilt	-	-	-
	Right	Cheek	-	-	-
		Tilt	-	-	-
2-slot GPRS	Power		28.5 dBm	30.1 dBm	28.0 dBm
Slide closed	Left	Cheek	0.599	0.701	0.830
		Tilt	-	0.325	-
	Right	Cheek	-	0.366	-
		Tilt	-	0.315	-
2-slot GPRS	Power		32.0 dBm	31.9 dBm	27.8 dBm
Slide open	Left	Cheek	-	0.502	-
		Tilt	-	0.413	-
	Right	Cheek	-	0.408	-
		Tilt	-	0.340	-
2-slot GPRS	Power		28.7 dBm	29.9 dBm	28.0 dBm
Slide MPS	Left	Cheek	-	0.533	-
		Tilt	-	0.408	-
	Right	Cheek	-	0.299	-
		Tilt	-	0.385	-

table continues...

Slide option	Test configuration		SAR, averaged over 1g (W/kg)		
			Ch 512 1850.2 MHz	Ch 661 1880.0 MHz	Ch 810 1909.8 MHz
3-slot GPRS	Power		26.6 dBm	28.0 dBm	25.9 dBm
Slide closed	Left	Cheek	-	0.636	-
		Tilt	-	-	-
	Right	Cheek	-	-	-
		Tilt	-	-	-
2-slot 8PSK EGPRS	Power		27.0 dBm	24.8 dBm	22.2 dBm
Slide closed	Left	Cheek	-	-	0.158
		Tilt	-	-	-
	Right	Cheek	-	-	-
		Tilt	-	-	-
Slide option	Test configuration		SAR, averaged over 1g (W/kg)		
			Ch 9262 1852.4 MHz	Ch 9400 1880.0 MHz	Ch 9538 1907.6 MHz
WCDMA	Power		20.4 dBm	24.4 dBm	22.0 dBm
Slide closed	Left	Cheek	0.522	0.483	0.651
		Tilt	-	0.284	-
	Right	Cheek	-	0.337	-
		Tilt	-	0.277	-
WCDMA	Power		23.2 dBm	24.4 dBm	21.9 dBm
Slide open	Left	Cheek	-	0.468	-
		Tilt	-	0.346	-
	Right	Cheek	-	0.390	-
		Tilt	-	0.278	-
WCDMA	Power		20.7 dBm	21.3 dBm	22.3 dBm
Slide MPS	Left	Cheek	-	0.259	-
		Tilt	-	0.354	-
	Right	Cheek	-	0.268	-
		Tilt	-	0.329	-
2-slot GPRS Slide closed	Left Cheek, BT active		-	-	0.901

2450MHz Head SAR results

Slide option	Test configuration		SAR, averaged over 1g (W/kg)		
			Ch 1 2412.0 MHz	Ch 7 2442.0 MHz	Ch 11 2462.0 MHz
WLAN	Power		19.5 dBm	23.5 dBm	23.1 dBm
Slide closed	Left	Cheek	-	0.049	-
		Tilt	-	0.060	-
	Right	Cheek	-	0.066	-
		Tilt	-	0.062	-
WLAN	Power		18.2 dBm	20.9 dBm	20.7 dBm
Slide open	Left	Cheek	-	0.012	-
		Tilt	-	0.014	-
	Right	Cheek	-	0.013	-
		Tilt	-	0.014	-
WLAN	Power		20.9 dBm	22.6 dBm	22.2 dBm
Slide MPS	Left	Cheek	-	0.057	-
		Tilt	-	0.125	-
	Right	Cheek	-	0.081	-
		Tilt	0.148	0.138	0.127

2450MHz Head SAR results - corrected for power drift

Slide option	Test configuration		SAR, averaged over 1g (W/kg)		
			Ch 1 2412.0 MHz	Ch 7 2442.0 MHz	Ch 11 2462.0 MHz
WLAN	Power		19.5 dBm	23.5 dBm	23.1 dBm
Slide closed	Left	Cheek	-	0.053	-
		Tilt	-	0.068	-
	Right	Cheek	-	0.090	-
		Tilt	-	0.071	-
WLAN	Power		18.2 dBm	20.9 dBm	20.7 dBm
Slide open	Left	Cheek	-	0.015	-
		Tilt	-	0.014	-
	Right	Cheek	-	0.026	-
		Tilt	-	0.018	-

table continues...

Slide option	Test configuration		SAR, averaged over 1g (W/kg)		
			Ch 1 2412.0 MHz	Ch 7 2442.0 MHz	Ch 11 2462.0 MHz
WLAN	Power		20.9 dBm	22.6 dBm	22.2 dBm
Slide MPS	Left	Cheek	-	0.064	-
		Tilt	-	0.139	-
	Right	Cheek	-	0.081	-
		Tilt	0.159	0.155	0.136

The measured Body SAR values for the test device are tabulated below:

850MHz Body SAR results

Option used	Device orientation	Test configuration	SAR, averaged over 1g (W/kg)		
			Ch 128 824.2 MHz	Ch 190 836.6 MHz	Ch 251 848.8 MHz
2-slot GPRS		Power	24.6 dBm	25.3 dBm	23.9 dBm
Slide closed	Display facing phantom	Without headset	-	0.290	-
		Headset HS-45 + AD-54	-	0.159	-
	Back facing phantom	Without headset	0.672	0.707	0.689
		Headset HS-45 + AD-54	-	0.397	-
2-slot GPRS Slide closed	Back facing phantom	Without headset, BT active	-	0.679	-

1900MHz Body SAR results

Option used	Device orientation	Test configuration	SAR, averaged over 1g (W/kg)		
			Ch 512 1850.2 MHz	Ch 661 1880.0 MHz	Ch 810 1909.8 MHz
2-slot GPRS		Power	28.5 dBm	30.1 dBm	28.0 dBm
Slide closed	Display facing phantom	Without headset	-	0.204	-
		Headset HS-45 + AD-54	-	0.178	-
	Back facing phantom	Without headset	0.531	0.537	0.555
		Headset HS-45 + AD-54	-	0.456	-
Option used	Device orientation	Test configuration	SAR, averaged over 1g (W/kg)		
			Ch 9262 1852.4 MHz	Ch 9400 1880.0 MHz	Ch 9538 1907.6 MHz
WCDMA		Power	20.4 dBm	24.4 dBm	22.0 dBm
Slide closed	Display facing phantom	Without headset	-	0.176	-
		Headset HS-45 + AD-54	-	0.152	-
	Back facing phantom	Without headset	0.528	0.529	0.567
		Headset HS-45 + AD-54	-	0.448	-
WCDMA Slide closed	Back facing phantom	Without headset, BT active	-	-	0.514

2450MHz Body SAR results

Option used	Device orientation	Test configuration	SAR, averaged over 1g (W/kg)		
			Ch 1 2412.0 MHz	Ch 7 2442.0 MHz	Ch 11 2462.0 MHz
WLAN		Power	19.5 dBm	23.5 dBm	23.1 dBm
Slide closed	Back facing phantom	Without headset	-	0.064	-
		Headset HS-45 + AD-54	0.064	0.069	0.056

2450MHz Body SAR results - corrected for power drift

Option used	Device orientation	Test configuration	SAR, averaged over 1g (W/kg)		
			Ch 1 2412.0 MHz	Ch 7 2442.0 MHz	Ch 11 2462.0 MHz
WLAN		Power	19.5 dBm	23.5 dBm	23.1 dBm
Slide closed	Back facing phantom	Without headset	-	0.066	-
		Headset HS-45 + AD-54	0.065	0.069	0.059

Simultaneous transmissions: Combined SAR results

Test configuration	Max. 1g SAR results				Combined 1g SAR values		
	WLAN 2450	2-slot GPRS850	2-slot GPRS1900	WCDMA 1900	WLAN 2450 + 2-slot GPRS850	WLAN 2450 + 2-slot GPRS1900	WLAN 2450 + WCDMA 1900
Head: Left, Cheek	0.064	0.750	0.830	0.651	0.814	0.894	0.715
Head: Left, Tilt	0.139	0.465	0.413	0.354	0.604	0.552	0.493
Head: Right, Cheek	0.090	0.913	0.408	0.390	1.003	0.498	0.480
Head: Right, Tilt	0.159	0.526	0.385	0.329	0.685	0.544	0.488
Body: Without Headset	0.066	0.707	0.555	0.567	0.773	0.621	0.633
Body: Headset HS-45 + AD-54	0.069	0.397	0.456	0.448	0.466	0.525	0.517

Combining the maximum SAR values of WLAN2450 and the cellular bands tends to overestimate the SAR value since their maxima do not necessarily occur in the same location.

Plots of the Measurement scans are given in Appendix B.

APPENDIX A: SYSTEM CHECKING SCANS

Date/Time: 2008-06-04 08:52:28

Test Laboratory: TCC Nokia

Type: D835V2; Serial: D835V2 - SN:480

Communication System: CW835

Frequency: 835 MHz; Duty Cycle: 1:1

Medium: HSL900; Medium Notes: 21.1C

Medium parameters used: $f = 835$ MHz; $\sigma = 0.905$ mho/m; $\epsilon_r = 41.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1395
- ConvF(6.1, 6.1, 6.1); Calibrated: 2007-07-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn538; Calibrated: 2007-07-06
- Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1449
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

d=15mm, Pin=250mW/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.46 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 53.7 V/m

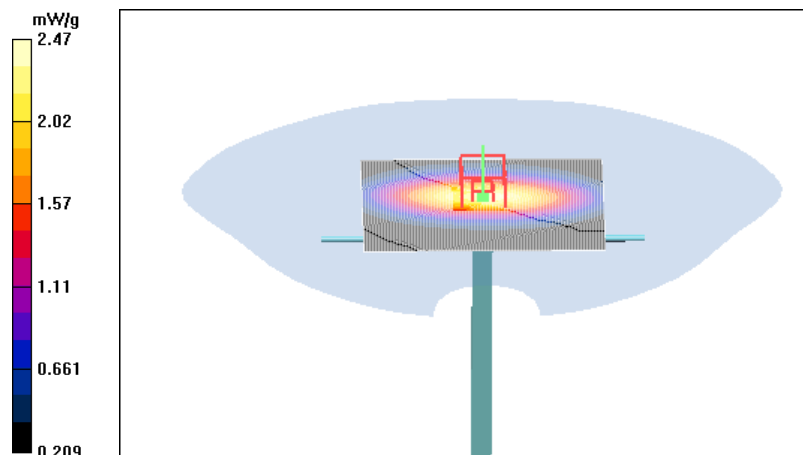
Peak SAR (extrapolated) = 3.46 W/kg

SAR(1 g) = 2.29 mW/g

SAR(10 g) = 1.48 mW/g

Power Drift = -0.008 dB

Maximum value of SAR (measured) = 2.47 mW/g



Date/Time: 2008-06-05 09:28:33

Test Laboratory: TCC Nokia

Type: D835V2; Serial: D835V2 - SN:480

Communication System: CW835

Frequency: 835 MHz; Duty Cycle: 1:1

Medium: HSL835; Medium Notes: 21.1C

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.909 \text{ mho/m}$; $\epsilon_r = 41.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1395
- ConvF(6.1, 6.1, 6.1); Calibrated: 2007-07-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn538; Calibrated: 2007-07-06
- Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1449
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

d=15mm, Pin=250mW/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.50 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.8 V/m

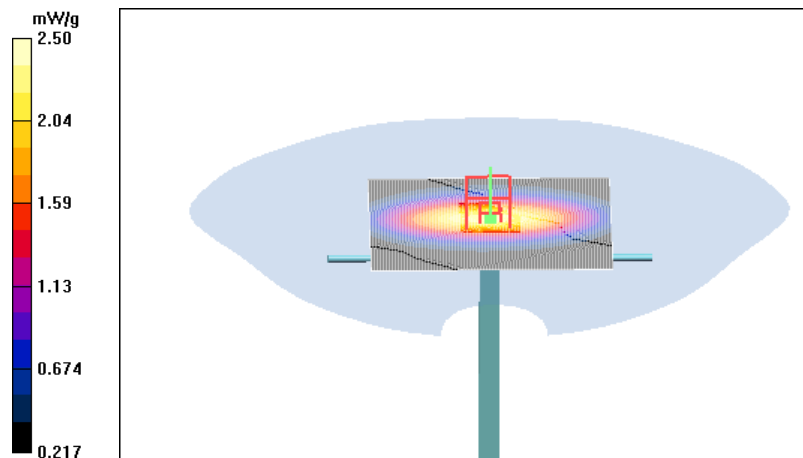
Peak SAR (extrapolated) = 3.49 W/kg

SAR(1 g) = 2.32 mW/g

SAR(10 g) = 1.5 mW/g

Power Drift = -0.049 dB

Maximum value of SAR (measured) = 2.50 mW/g



Date/Time: 2008-06-06 11:55:52

Test Laboratory: TCC Nokia

Type: D835V2; Serial: D835V2 - SN:480

Communication System: CW835

Frequency: 835 MHz; Duty Cycle: 1:1

Medium: HSL835; Medium Notes: 21.3C

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.908 \text{ mho/m}$; $\epsilon_r = 41.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1395
- ConvF(6.1, 6.1, 6.1); Calibrated: 2007-07-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn538; Calibrated: 2007-07-06
- Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1449
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

d=15mm, Pin=250mW/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.47 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.3 V/m

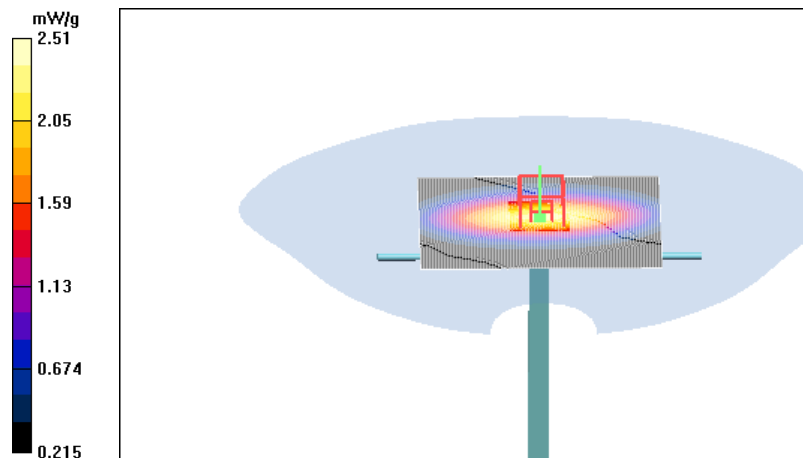
Peak SAR (extrapolated) = 3.52 W/kg

SAR(1 g) = 2.31 mW/g

SAR(10 g) = 1.49 mW/g

Power Drift = -0.008 dB

Maximum value of SAR (measured) = 2.51 mW/g



Date/Time: 2008-05-20 07:44:10

Test Laboratory: TCC Nokia

Type: **D1900V2**; Serial: **D1900V2 - SN:5d013**

Communication System: CW1900

Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: HSL1900; Medium Notes: 21.0C

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.45$ mho/m; $\epsilon_r = 39.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1395
- ConvF(4.85, 4.85, 4.85); Calibrated: 2007-07-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn538; Calibrated: 2007-07-06
- Phantom: SAM 3; Type: Twin SAM 040 CA; Serial: TP-1018
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

d=15mm, Pin=250mW/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 13.0 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 92.8 V/m

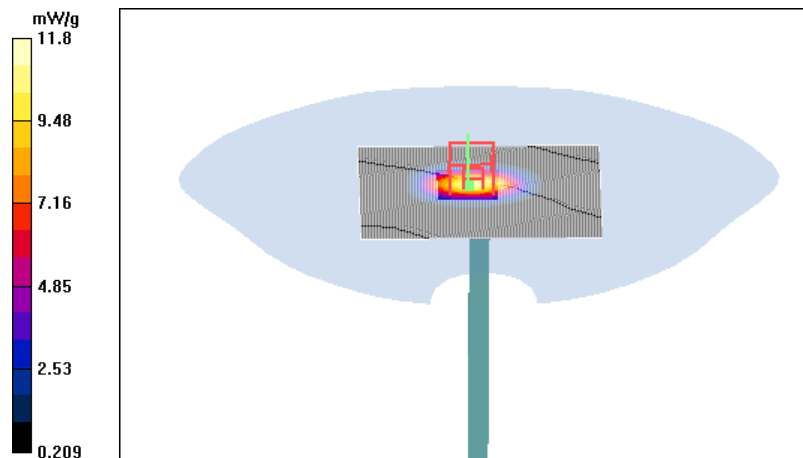
Peak SAR (extrapolated) = 17.9 W/kg

SAR(1 g) = 10.4 mW/g

SAR(10 g) = 5.52 mW/g

Power Drift = -0.001 dB

Maximum value of SAR (measured) = 11.8 mW/g



Date/Time: 2008-06-02 08:49:49

Test Laboratory: TCC Nokia

Type: D1900V2; Serial: D1900V2 - SN:5d013

Communication System: CW1900

Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: HSL1900; Medium Notes: t=21.0

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.39$ mho/m; $\epsilon_r = 39$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1766
- ConvF(5.12, 5.12, 5.12); Calibrated: 2007-10-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn728; Calibrated: 2008-04-23
- Phantom: SAM 3; Type: SAM 4.0; Serial: 1272
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

d=15mm, Pin=250mW/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 11.6 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.7 V/m

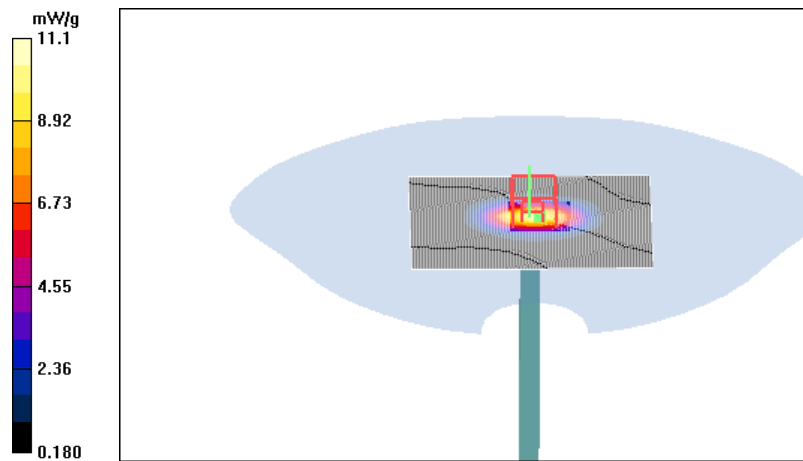
Peak SAR (extrapolated) = 17.4 W/kg

SAR(1 g) = 9.76 mW/g

SAR(10 g) = 5.12 mW/g

Power Drift = -0.007 dB

Maximum value of SAR (measured) = 11.1 mW/g



Date/Time: 2008-06-05 15:58:30

Test Laboratory: TCC Nokia

Type: D1900V2; Serial: D1900V2 - SN:5d013

Communication System: CW1900

Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: HSL1900; Medium Notes: t=20.9

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.41$ mho/m; $\epsilon_r = 38.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1766
- ConvF(5.12, 5.12, 5.12); Calibrated: 2007-10-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn728; Calibrated: 2008-04-23
- Phantom: SAM 3; Type: SAM 4.0; Serial: 1272
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

d=15mm, Pin=250mW/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 11.6 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.2 V/m

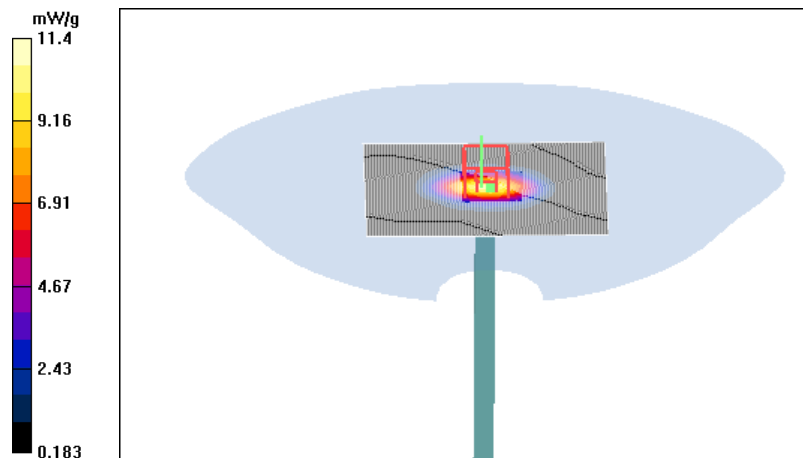
Peak SAR (extrapolated) = 18.2 W/kg

SAR(1 g) = 10.1 mW/g

SAR(10 g) = 5.31 mW/g

Power Drift = 0.004 dB

Maximum value of SAR (measured) = 11.4 mW/g



Date/Time: 2008-06-10 10:58:46

Test Laboratory: TCC Nokia

Type: D2450V2; Serial: D2450V2 - SN:729

Communication System: CW2450

Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: HSL2450; Medium Notes: 21.0C

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.85$ mho/m; $\epsilon_r = 39.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3131
- ConvF(4.48, 4.48, 4.48); Calibrated: 2008-04-22
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn728; Calibrated: 2008-04-23
- Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1179
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

d=15mm, Pin=250mW/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 17.3 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.9 V/m

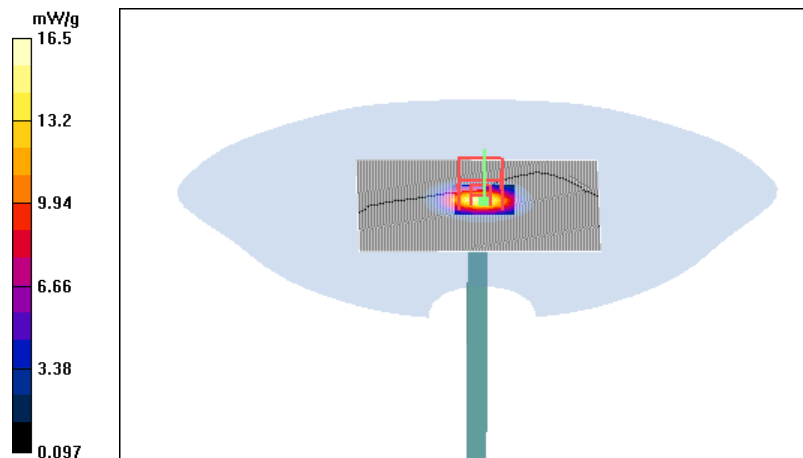
Peak SAR (extrapolated) = 30.8 W/kg

SAR(1 g) = 14.6 mW/g

SAR(10 g) = 6.74 mW/g

Power Drift = 0.010 dB

Maximum value of SAR (measured) = 16.5 mW/g



Date/Time: 2008-05-22 13:43:53

Test Laboratory: TCC Nokia

Type: D1900V2; Serial: D1900V2 - SN:5d013

Communication System: CW1900

Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: BSL1900; Medium Notes: t=21.0C

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.53$ mho/m; $\epsilon_r = 51.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1766
- ConvF(4.63, 4.63, 4.63); Calibrated: 2007-10-24
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn728; Calibrated: 2008-04-23
- Phantom: SAM 2; Type: Twin SAM 040 CA; Serial: TP - 1177
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

d=15mm, Pin=250mW/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 12.0 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 89.5 V/m

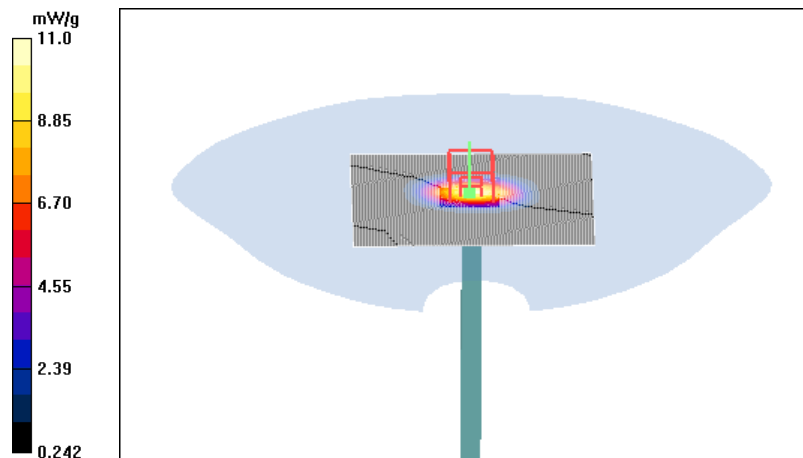
Peak SAR (extrapolated) = 16.7 W/kg

SAR(1 g) = 9.75 mW/g

SAR(10 g) = 5.21 mW/g

Power Drift = 0.006 dB

Maximum value of SAR (measured) = 11.0 mW/g



Date/Time: 2008-06-11 10:33:14

Test Laboratory: TCC Nokia

Type: D2450V2; Serial: D2450V2 - SN:729

Communication System: CW2450

Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: BSL2450; Medium Notes: 20.8C

Medium parameters used: $f = 2450$ MHz; $\sigma = 2.03$ mho/m; $\epsilon_r = 50.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3131
- ConvF(4.16, 4.16, 4.16); Calibrated: 2008-04-22
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn728; Calibrated: 2008-04-23
- Phantom: SAM 3; Type: SAM 4.0; Serial: 1272
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

d=15mm, Pin=250mW/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 17.1 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 92.0 V/m

Peak SAR (extrapolated) = 30.2 W/kg

SAR(1 g) = 14.6 mW/g

SAR(10 g) = 6.7 mW/g

Power Drift = -0.045 dB

Maximum value of SAR (measured) = 16.9 mW/g

