

SAR Compliance Test Report

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Tested devices:	RA-2		
FCC ID:	PDNRA-2	IC:	661R-RA2
Supplement reports:	-		
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 Techniques		
Documentation:	The documentation of the testing performed on the tested devices is archived for 15 years at TCC Oulu.		
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.		

Date and signatures:

2004-06-24

For the contents:



Kai Niskala
Test Engineer

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1. SUMMARY OF SAR TEST REPORT

1.1 Test Details

Period of test	2004-06-15 – 2004-06-18
SN, HW and SW numbers of tested device	SN: 004400/41/170551/8, HW:5002 , SW: 04.2200, DUT#: 30120
Batteries used in testing	BP-5L DUT#'s: 30121, 30122, 30123
Headsets used in testing	HS-3 DUT#: 0044
Other accessories used in testing	MMC card
State of sample	prototype unit
Notes	WLAN can transmit simultaneously with either GSM or GPRS in this device

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	SAR limit (1g avg)	Measured SAR value (1g avg)	Result
GSM1900 + WLAN2450	1.6 W/kg	0.92 W/kg	PASSED

1.2.2 Body Worn Configuration

Mode	Separation distance	SAR limit (1g avg)	Measured SAR value (1g avg)	Result
GPRS1900 + WLAN2450	1.5 cm	1.6 W/kg	1.53 W/kg	PASSED

1.2.3 Maximum Drift

Maximum drift during measurements	-0.32 dB
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1.2.4 Measurement Uncertainty

Extended Uncertainty (k=2) 95%	±29.1%
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2. DESCRIPTION OF THE DEVICE UNDER TEST (DUT)

Device category	portable				
Exposure environment	general population/uncontrolled				
Modes and Bands of Operation	GSM 1900	GPRS (GSM)	EGPRS(EDGE)	BT	WLAN
Modulation Mode	GMSK	GMSK	8PSK	GFSK	
Duty Cycle	1/8	1/8 or 2/8	1/8 or 2/8		1
Transmitter Frequency Range (MHz)	1850.2 - 1909.8	1850.2 - 1909.8	1850.2 - 1909.8	2400.0 – 2483.5	2412.0 – 2472.0

Outside of USA and Canada, the transmitter of tested device is capable of operating also in GSM900 and GSM1800 , which are not part of this filing.

EGPRS mode was not measured, because maximum averaged output power is more than 2 dB lower in EGPRS mode than in GPRS mode.

2.1 Picture of Device



2.2 Description of the Antenna

The device has two internal patch antennas. The antenna for GSM/GPRS is at the top of the device; the antenna for WLAN/Bluetooth is at the bottom of the device.

3. TEST CONDITIONS

3.1 Temperature and Humidity

Ambient temperature (°C):	21.5 to 23.5
Ambient humidity (RH %):	35 to 45

3.2 Test Signal, Frequencies, and Output Power

The WLAN transmitter of the device was put into operation by using control software. The GSM/GPRS and Bluetooth transmitters of the device were put into operation by using a call tester. Communications between the device and the call testers were established by air link.

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

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

The power output was measured by a separate accredited test laboratory on the same unit 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, DASY 4 software version 4.2, manufactured by Schmid & Partner Engineering AG (SPEAG) in Switzerland. The SAR extrapolation algorithm used in all measurements on the test device was the 'worst-case extrapolation' algorithm.

The following table lists calibration dates of SPEAG components:

Test Equipment	Serial Number	Calibration interval	Calibration expiry
DAE V1	555	12 months	02/05
E-field Probe ET3DV6	1765	12 months	02/05
Dipole Validation Kit, D1900V2	5d030	24 months	04/05
Dipole Validation Kit, D2450V2	729	24 months	04/05

Additional test equipment used in testing:

Test Equipment	Model	Serial Number	Calibration interval	Calibration expiry
Signal Generator	HP 8657B	3630U08114	12 months	06/05
Signal Generator	R&S SMT 06	100389	12 months	12/04
Amplifier	Amplifier Research 5S1G4	306024	-	-
Power Meter	R&S NRT	101143	12 months	04/05
Power Sensor	R&S NRT-Z43	100239	12 months	04/05
Power Meter	Agilent E4416A	GB41291465	12 months	06/05
Power Sensor	Agilent E9323A	US40411045	12 months	06/05
Thermometer	Fluke 51 II	84350048	12 months	06/05
Network Analyzer	HP 8753D	3410A08934	12 months	06/05
Dielectric Probe Kit	Agilent 85070D	US01440162	-	-
Radio Communication Tester	CMU 200	103293	12 months	04/05
Radio Communication Tester	CMU 200 BT	100084	12 months	03/05

4.1.1 Isotropic E-field probe 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 A
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

4.2 Phantoms

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

Validation tests were 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 test device in all tests whilst a tripod was used to position the validation dipoles against the flat section of phantom.

4.3 Simulating Liquids

Recommended values for the dielectric parameters of the simulating liquids are given in IEEE 1528-2003 and FCC Supplement C to OET Bulletin 65. All tests were carried out using liquids

whose dielectric parameters were within $\pm 5\%$ of the recommended values. All verifications and tests were carried out within 24 hours of measuring the dielectric parameters using dielectric probe kit and network analyser.

The depth of the liquid was 15.0 ± 0.5 cm measured from the ear reference point during validation and device measurements.

4.3.1 Liquid recipes

The following recipes were used for Head and Body liquids:

1900MHz band		
Ingredient	Head (% by weight)	Body (% by weight)
Deionised Water	54.88	69.02
Butyl Diglycol	44.91	30.76
Salt	0.21	0.22

2450MHz band		
Ingredient	Head (% by weight)	Body (% by weight)
Deionised Water	56	70
Tween 20	44	-
Butyl Diglycol	-	30

4.3.2 Verification of the System

The manufacturer calibrates the probes annually. A SAR measurement was made following the determination of the dielectric parameters of the liquids, using the dipole validation kit. The power level used by manufacturer in dipole calibration was supplied to the dipole antenna (see Appendix D). The antenna was placed under the flat section of the twin SAM phantom. The validation results (dielectric parameters and SAR values) are given in the table below.

System verification, head tissue simulant

f [MHz]	Description	SAR [W/kg], 1g	Dielectric Parameters		Temp [°C]
			ϵ_r	σ [S/m]	
1900	Reference result	10.5	38.8	1.44	N/A
	$\pm 10\%$ window	9.5 - 11.6			
	2004-06-15	10.3	38.7	1.45	21.9
2450	Reference result	13.9	37.3	1.84	N/A
	$\pm 10\%$ window	12.5 – 15.3			
	2004-06-16	13.0	37.5	1.89	22.3

System verification, body tissue simulant

f [MHz]	Description	SAR [W/kg], 1g	Dielectric Parameters		Temp [°C]
			ϵ_r	σ [S/m]	
1900	Reference result	10.7	51.2	1.59	N/A
	$\pm 10\%$ window	9.6 - 11.8			
	2004-06-17	10.8	52.4	1.58	22.0
2450	Reference result	13.7	50.5	1.97	N/A
	$\pm 10\%$ window	12.3 – 15.1			
	2004-06-18	14.3	52.6	2.05	21.9

Plots of the Verification 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]	
1880	Recommended value	40.0	1.40	N/A
	$\pm 5\%$ window	38.0 – 42.0	1.33 – 1.47	
	2004-06-15	38.8	1.43	22
2442	Recommended value	39.2	1.80	N/A
	$\pm 5\%$ window	37.2 – 41.2	1.71 – 1.89	
	2004-06-16	37.5	1.87	22

Body tissue simulant measurements

f [MHz]	Description	Dielectric Parameters		Temp [°C]
		ϵ_r	σ [S/m]	
1880	Recommended value	53.3	1.52	N/A
	$\pm 5\%$ window	50.6 – 56.0	1.44 – 1.60	
	2004-06-17	52.4	1.56	22
2442	Recommended value	52.7	1.95	N/A
	$\pm 5\%$ window	50.1 – 55.3	1.85 – 2.05	
	2004-06-18	52.6	2.03	22

5. DESCRIPTION OF THE TEST PROCEDURE

5.1 Device Holder

The test 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 test device within the SPEAG holder. The spacer positions the test 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 Test Positions

5.2.1 Against Phantom Head

Measurements were made in “cheek” and “tilt” positions on both the left hand and right hand sides of the phantom.

The positions used in the measurements were according to 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 Techniques".



Photo of the device in “cheek” position, for GSM testing on the left and for WLAN on the right



Photo of the device in “tilt” position, for GSM testing on the left and for WLAN on the right

5.2.2 Body Worn Configuration

The device was placed in the SPEAG holder using the Nokia spacer and placed below the flat section of the phantom. The distance between the device and the phantom was kept at 1.5cm using a separate flat spacer that was removed before the start of the measurements. The device was oriented with its antenna facing the phantom since this orientation gives higher results.

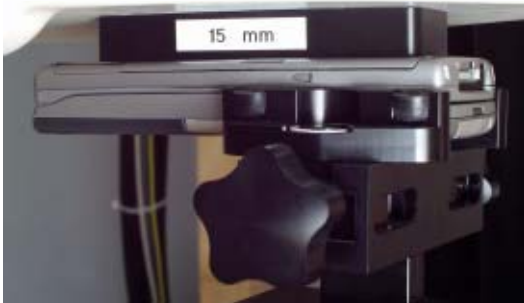


Photo of the device positioned for Body SAR measurement, for GPRS on the left and for WLAN on the right. The spacer was removed for the tests.

5.3 Scan Procedures

First coarse scans were used for determination of the field distribution. Next a cube scan, 5x5x7 or 7x7x7 points covering a volume of 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 coarse scan and again at the end of the cube scan.

5.4 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 cube 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 cube 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	± 4.8	N	1	1	± 4.8	∞
Axial Isotropy	E2.2	± 4.7	R	$\sqrt{3}$	$(1-c_p)^{1/2}$	± 1.9	∞
Hemispherical Isotropy	E2.2	± 9.6	R	$\sqrt{3}$	$(c_p)^{1/2}$	± 3.9	∞
Boundary Effect	E2.3	± 8.3	R	$\sqrt{3}$	1	± 4.8	∞
Linearity	E2.4	± 4.7	R	$\sqrt{3}$	1	± 2.7	∞
System Detection Limits	E2.5	± 1.0	R	$\sqrt{3}$	1	± 0.6	∞
Readout Electronics	E2.6	± 1.0	N	1	1	± 1.0	∞
Response Time	E2.7	± 0.8	R	$\sqrt{3}$	1	± 0.5	∞
Integration Time	E2.8	± 2.6	R	$\sqrt{3}$	1	± 1.5	∞
RF Ambient Conditions - Noise	E6.1	± 3.0	R	$\sqrt{3}$	1	± 1.7	∞
RF Ambient Conditions - Reflections	E6.1	± 3.0	R	$\sqrt{3}$	1	± 1.7	∞
Probe Positioner Mechanical Tolerance	E6.2	± 0.4	R	$\sqrt{3}$	1	± 0.2	∞
Probe Positioning with respect to Phantom Shell	E6.3	± 2.9	R	$\sqrt{3}$	1	± 1.7	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	E5.2	± 3.9	R	$\sqrt{3}$	1	± 2.3	∞
Test sample Related							
Test Sample Positioning	E4.2.1	± 6.0	N	1	1	± 6.0	11
Device Holder Uncertainty	E4.1.1	± 5.0	N	1	1	± 5.0	7
Output Power Variation - SAR drift measurement	6.6.3	± 10.0	R	$\sqrt{3}$	1	± 5.8	∞
Phantom and Tissue Parameters							
Phantom Uncertainty (shape and thickness tolerances)	E3.1	± 4.0	R	$\sqrt{3}$	1	± 2.3	∞
Liquid Conductivity Target - tolerance	E3.2	± 5.0	R	$\sqrt{3}$	0.64	± 1.8	∞
Liquid Conductivity - measurement uncertainty	E3.3	± 5.5	N	1	0.64	± 3.5	5
Liquid Permittivity Target tolerance	E3.2	± 5.0	R	$\sqrt{3}$	0.6	± 1.7	∞
Liquid Permittivity - measurement uncertainty	E3.3	± 2.9	N	1	0.6	± 1.7	5
Combined Standard Uncertainty			RSS			± 14.5	187
Coverage Factor for 95%			k=2				
Expanded Standard Uncertainty						± 29.1	

7. RESULTS

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

1900MHz Head SAR results

Mode and Band	Position		SAR, averaged over 1g (W/kg)		
			Ch 512 1850.2 MHz	Ch 661 1880.0 MHz	Ch 810 1909.8 MHz
GSM1900	Power level (EIRP)		31.47 dBm	30.29 dBm	28.82 dBm
	Left	Cheek		0.57	
		Tilt	0.85	0.65	0.76
	Right	Cheek		0.52	
		Tilt		0.61	
	Left Tilt position repeated with MMC card		0.86	0.66	0.80
	Highest SAR value measurement in this band repeated with BT active		0.86		

2450MHz Head SAR results

Mode and Band	Position		SAR, averaged over 1g (W/kg)		
			Ch 1 2412.0 MHz	Ch 7 2442.0 MHz	Ch 13 2472.0 MHz
WLAN2450					
	Left	Cheek	0.063	0.057	0.048
		Tilt		0.056	
	Right	Cheek		0.053	
		Tilt		0.050	
	Left Cheek position repeated with MMC card		0.064	0.060	0.047

Combining the maximum SAR values of GSM1900 (0.86 W/kg) and WLAN2450 (0.064 W/kg) yields a maximum value of 0.92W/kg. This value is an overestimate of SAR since these maxima don't occur in the same test configuration.

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

1900MHz Body SAR results

Mode and Band	Body-worn location setup	SAR, averaged over 1g (W/kg)		
		Ch 512 1850.2 MHz	Ch 661 1880.0 MHz	Ch 810 1909.8 MHz
2-slot GPRS1900				
	Without headset	0.95	1.00	1.03
	Headset HS-3	1.04	1.04	1.09
	Headset HS-3 and MMC card	1.01	1.06	1.22
	Highest SAR value measurement in this mode repeated with BT active			1.19

2450MHz Body SAR results

Mode and Band	Body-worn location setup	SAR, averaged over 1g (W/kg)		
		Ch 1 2412.0 MHz	Ch 7 2442.0 MHz	Ch 13 2472.0 MHz
WLAN2450				
	Without headset	0.23	0.28	0.27
	Headset HS-3	0.20	0.22	0.23
	Without headset and with MMC card	0.25	0.30	0.31

Combining the maximum SAR values of GPRS1900 (1.22 W/kg) and WLAN2450 (0.31 W/kg) yields a maximum value of 1.53 W/kg. This value is an overestimate of SAR since these maxima don't occur in the same location or in the same test configuration.

Plots of the Measurement scans are given in Appendix B.

APPENDIX A: VALIDATION SCANS

Date/Time: 06/15/04 09:50:22

Test Laboratory: TCC Oulu

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d030

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: HSL1900 Medium parameters used (interpolated): $f = 1900$ MHz; $\sigma = 1.45$ mho/m; $\epsilon_r = 38.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1765; ConvF(5.24, 5.24, 5.24); Calibrated: 16.02.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn555; Calibrated: 10.02.2004
- Phantom: SAM 3; Type: SAM 4.0; Serial: 1215
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

d=10mm, Pin=250mW, t=21.9 C/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 94.8 V/m; Power Drift = -0.1 dB

Maximum value of SAR (interpolated) = 12.3 mW/g

[Info: Interpolated medium parameters used for SAR evaluation!](#)**d=10mm, Pin=250mW, t=21.9 C/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

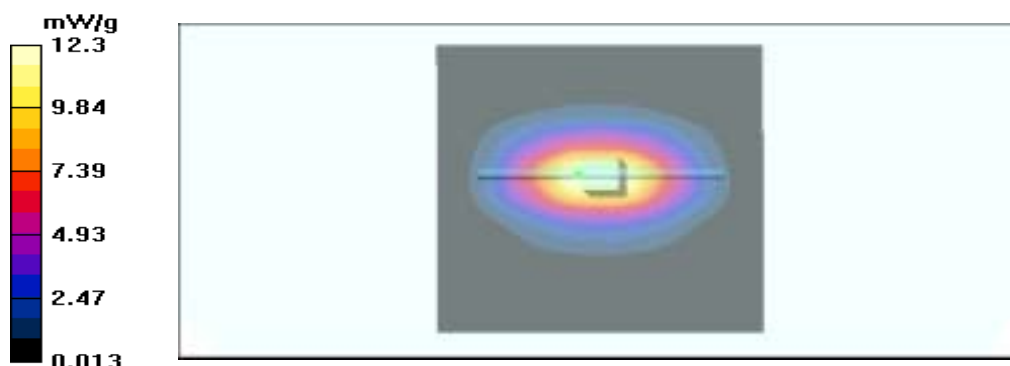
Reference Value = 94.8 V/m; Power Drift = -0.1 dB

Maximum value of SAR (measured) = 11.7 mW/g

Peak SAR (extrapolated) = 18.3 W/kg

SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.38 mW/g[Info: Interpolated medium parameters used for SAR evaluation!](#)

Warning: Maximum averaged SAR over 10 g is located on the boundary of the measurement cube. This cube might not incorporate the absolute averaged SAR. Please consider a refinement of the Area Scan measurement.



Date/Time: 06/16/04 10:12:45

Test Laboratory: TCC Oulu

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:729

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: HSL2450 Medium parameters used: $f = 2450$ MHz; $\sigma = 1.89$ mho/m; $\epsilon_r = 37.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1765; ConvF(4.8, 4.8, 4.8); Calibrated: 16.02.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn555; Calibrated: 10.02.2004
- Phantom: SAM 2; Type: SAM 4.0; Serial: 1272
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

d=10mm, Pin=250mW, t=22.3 C/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 91.4 V/m; Power Drift = -0.0004 dB

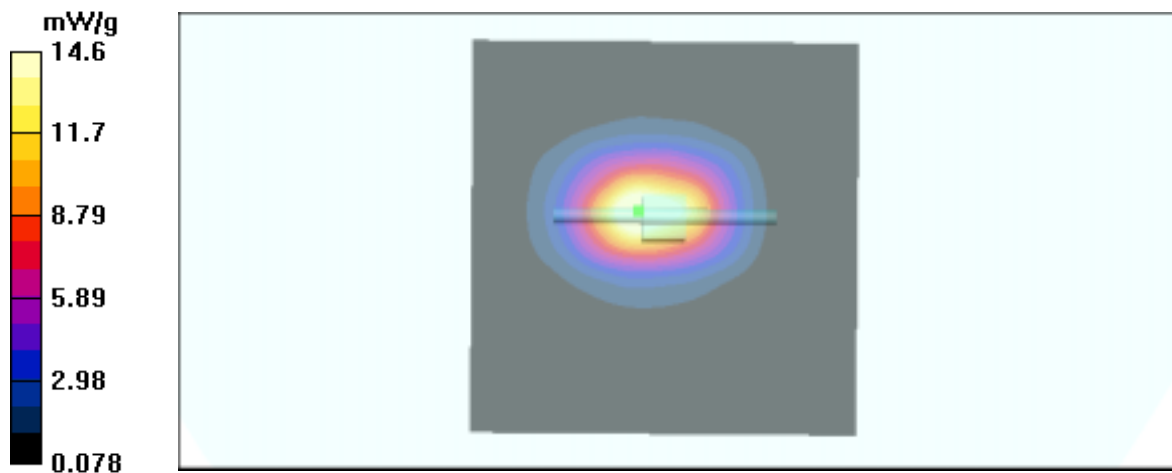
Maximum value of SAR (interpolated) = 16.9 mW/g

d=10mm, Pin=250mW, t=22.3 C/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 91.4 V/m; Power Drift = -0.0004 dB

Maximum value of SAR (measured) = 14.6 mW/g

Peak SAR (extrapolated) = 27.4 W/kg

SAR(1 g) = 13 mW/g; SAR(10 g) = 6 mW/g

Date/Time: 06/17/04 09:47:32

Test Laboratory: TCC Oulu

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d030

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: BSL1900 Medium parameters used (interpolated): $f = 1900$ MHz; $\sigma = 1.58$ mho/m; $\epsilon_r = 52.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1765; ConvF(4.59, 4.59, 4.59); Calibrated: 16.02.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn555; Calibrated: 10.02.2004
- Phantom: SAM 3; Type: SAM 4.0; Serial: 1215
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

d=10mm, Pin=250mW, t=22.0 C/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 94.1 V/m; Power Drift = -0.0 dB

Maximum value of SAR (interpolated) = 13 mW/g

[Info: Interpolated medium parameters used for SAR evaluation!](#)**d=10mm, Pin=250mW, t=22.0 C/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

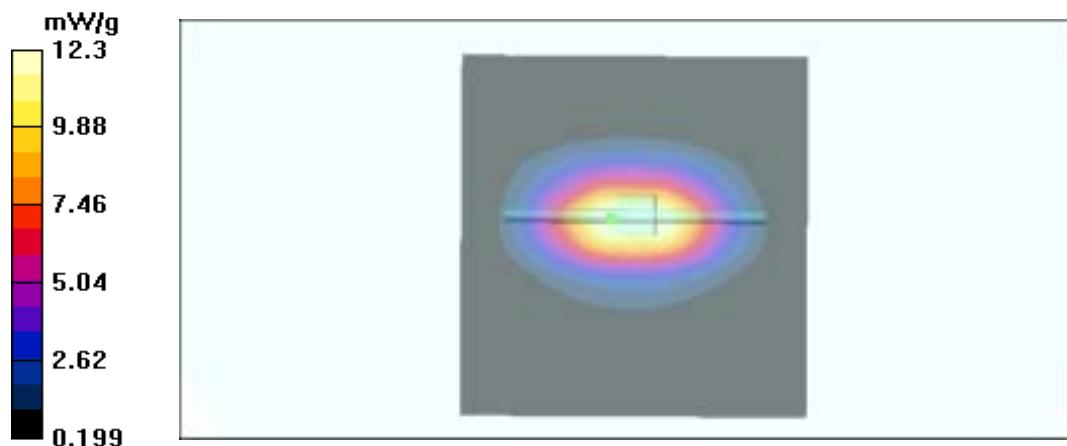
Reference Value = 94.1 V/m; Power Drift = -0.0 dB

Maximum value of SAR (measured) = 12.3 mW/g

Peak SAR (extrapolated) = 18.5 W/kg

SAR(1 g) = 10.8 mW/g; SAR(10 g) = 5.68 mW/g[Info: Interpolated medium parameters used for SAR evaluation!](#)

Warning: Maximum averaged SAR over 10 g is located on the boundary of the measurement cube. This cube might not incorporate the absolute averaged SAR. Please consider a refinement of the Area Scan measurement.



Date/Time: 06/18/04 09:04:07

Test Laboratory: TCC Oulu

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:729

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: BSL2450 Medium parameters used: $f = 2450$ MHz; $\sigma = 2.05$ mho/m; $\epsilon_r = 52.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1765; ConvF(4.18, 4.18, 4.18); Calibrated: 16.02.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn555; Calibrated: 10.02.2004
- Phantom: SAM 3; Type: SAM 4.0; Serial: 1215
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

d=10mm, Pin=250mW, t=21.9 C/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Reference Value = 91.2 V/m; Power Drift = -0.0 dB

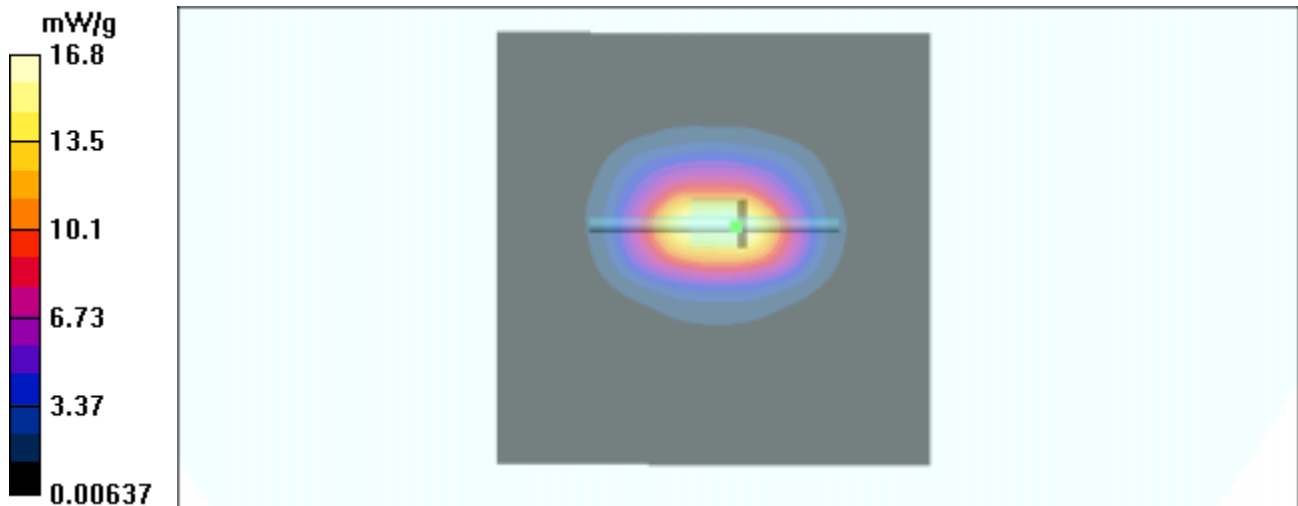
Maximum value of SAR (interpolated) = 16.8 mW/g

d=10mm, Pin=250mW, t=21.9 C/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 91.2 V/m; Power Drift = -0.0 dB

Maximum value of SAR (measured) = 15.9 mW/g

Peak SAR (extrapolated) = 33.4 W/kg

SAR(1 g) = 14.3 mW/g; SAR(10 g) = 6.51 mW/g

APPENDIX B: MEASUREMENT SCANS

Date/Time: 06/15/04 14:23:00

Test Laboratory: TCC Oulu

DUT: RA-2; Serial: 004400/41/170551/8

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: HSL1900 Medium parameters used: $f = 1880$ MHz; $\sigma = 1.43$ mho/m; $\epsilon_r = 38.8$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1765; ConvF(5.27, 5.27, 5.27); Calibrated: 16.02.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn555; Calibrated: 10.02.2004
- Phantom: SAM 3; Type: SAM 4.0; Serial: 1215
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Touch position - Middle, t=21.9 C, worst case extrapolation/Area Scan (51x111x1):

Measurement grid: dx=15mm, dy=15mm

Reference Value = 19.7 V/m; Power Drift = -0.0 dB

Maximum value of SAR (interpolated) = 0.594 mW/g

Touch position - Middle, t=21.9 C, worst case extrapolation/Zoom Scan (5x5x7)**(5x5x7)/Cube 0(upper):** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 19.7 V/m; Power Drift = -0.0 dB

Maximum value of SAR (measured) = 0.610 mW/g

Peak SAR (extrapolated) = 1.05 W/kg

SAR(1 g) = 0.571 mW/g; SAR(10 g) = 0.327 mW/g**Touch position - Middle, t=21.9 C, worst case extrapolation/Zoom Scan (5x5x7)****(5x5x7)/Cube 1(lower):** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

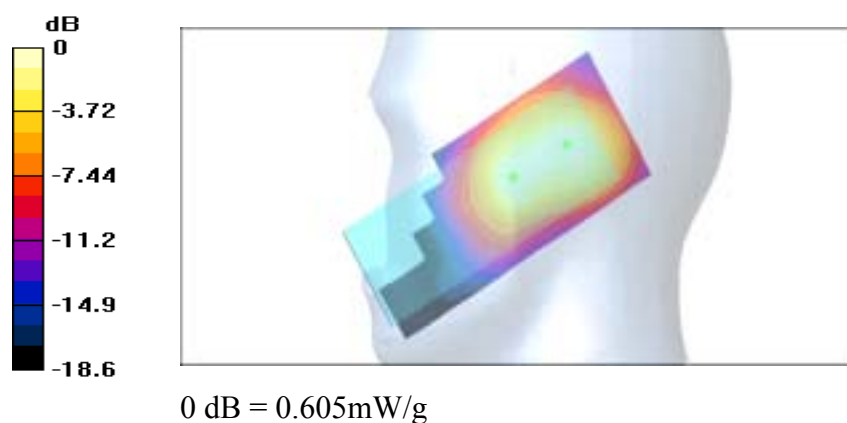
Reference Value = 19.7 V/m; Power Drift = -0.0 dB

Maximum value of SAR (measured) = 0.605 mW/g

Peak SAR (extrapolated) = 0.980 W/kg

SAR(1 g) = 0.571 mW/g; SAR(10 g) = 0.337 mW/g

Warning: Maximum averaged SAR over 10 g is located on the boundary of the measurement cube. This cube might not incorporate the absolute averaged SAR. Please consider a refinement of the Area Scan measurement.



Date/Time: 06/15/04 16:17:58

Test Laboratory: TCC Oulu

DUT: RA-2; Serial: 004400/41/170551/8; with MMC card; BT active

Communication System: GSM 1900; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium: HSL1900 Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.4$ mho/m; $\epsilon_r =$ 38.9; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1765; ConvF(5.27, 5.27, 5.27); Calibrated: 16.02.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn555; Calibrated: 10.02.2004
- Phantom: SAM 3; Type: SAM 4.0; Serial: 1215
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Tilt position - Low, t=22.1 C, worst case extrapolation/Area Scan (51x91x1):

Measurement grid: dx=15mm, dy=15mm

Reference Value = 25.5 V/m; Power Drift = -0.0 dB

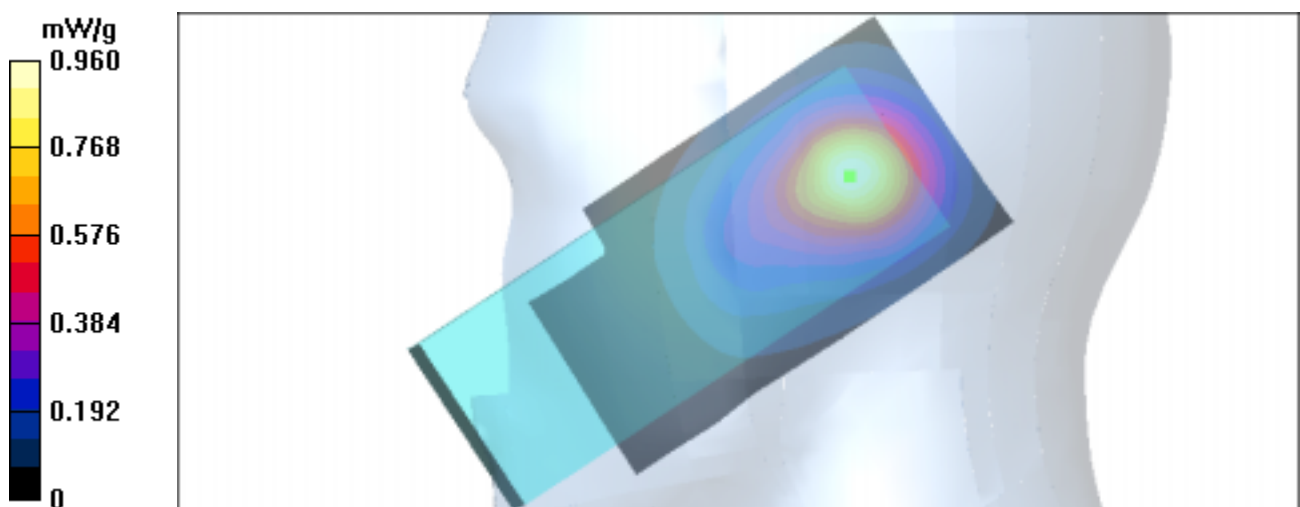
Maximum value of SAR (interpolated) = 0.960 mW/g

[Info: Interpolated medium parameters used for SAR evaluation!](#)**Tilt position - Low, t=22.1 C, worst case extrapolation/Zoom Scan (5x5x7)****(5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 25.5 V/m; Power Drift = -0.0 dB

Maximum value of SAR (measured) = 0.932 mW/g

Peak SAR (extrapolated) = 1.65 W/kg

SAR(1 g) = 0.863 mW/g; SAR(10 g) = 0.488 mW/g[Info: Interpolated medium parameters used for SAR evaluation!](#)

Date/Time: 06/15/04 12:57:35

Test Laboratory: TCC Oulu

DUT: RA-2; Serial: 004400/41/170551/8

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: HSL1900 Medium parameters used: $f = 1880$ MHz; $\sigma = 1.43$ mho/m; $\epsilon_r = 38.8$; $\rho = 1000$ kg/m³

Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1765; ConvF(5.27, 5.27, 5.27); Calibrated: 16.02.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn555; Calibrated: 10.02.2004
- Phantom: SAM 3; Type: SAM 4.0; Serial: 1215
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Touch position - Middle, t=21.9 C, worst case extrapolation/Area Scan (51x111x1):

Measurement grid: dx=15mm, dy=15mm

Reference Value = 17.9 V/m; Power Drift = 0.002 dB

Maximum value of SAR (interpolated) = 0.547 mW/g

Touch position - Middle, t=21.9 C, worst case extrapolation/Zoom Scan (5x5x7)**(5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 17.9 V/m; Power Drift = 0.002 dB

Maximum value of SAR (measured) = 0.551 mW/g

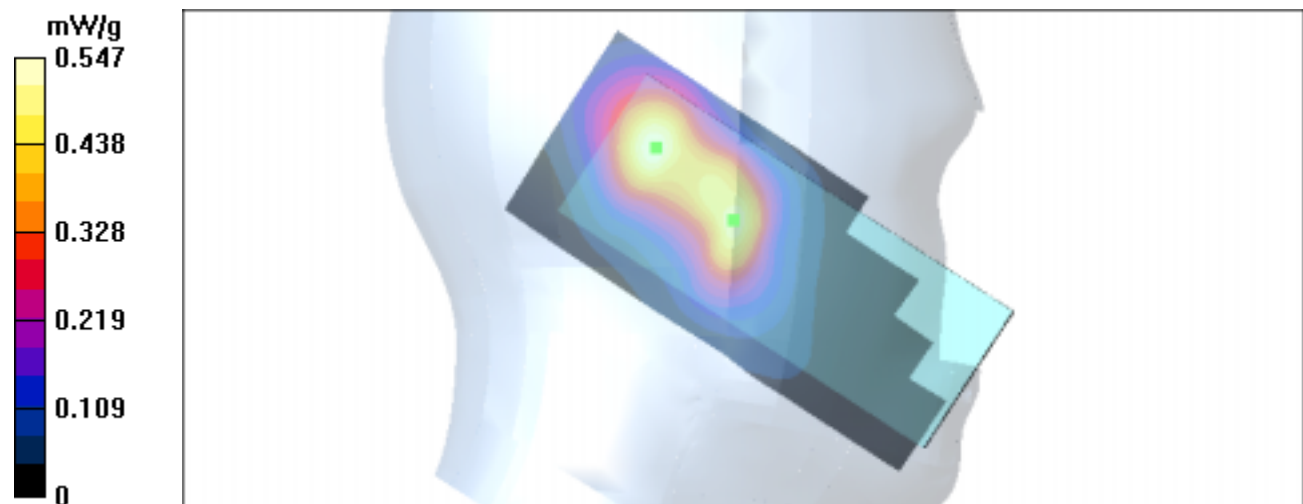
Peak SAR (extrapolated) = 0.964 W/kg

SAR(1 g) = 0.512 mW/g; SAR(10 g) = 0.288 mW/g**Touch position - Middle, t=21.9 C, worst case extrapolation/Zoom Scan (5x5x7)****(5x5x7)/Cube 1:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 17.9 V/m; Power Drift = 0.002 dB

Maximum value of SAR (measured) = 0.565 mW/g

Peak SAR (extrapolated) = 0.945 W/kg

SAR(1 g) = 0.519 mW/g; SAR(10 g) = 0.294 mW/g

Date/Time: 06/15/04 12:57:35

Test Laboratory: TCC Oulu

DUT: RA-2; Serial: 004400/41/170551/8

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: HSL1900 Medium parameters used: $f = 1880$ MHz; $\sigma = 1.43$ mho/m; $\epsilon_r = 38.8$; $\rho = 1000$ kg/m³

Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1765; ConvF(5.27, 5.27, 5.27); Calibrated: 16.02.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn555; Calibrated: 10.02.2004
- Phantom: SAM 3; Type: SAM 4.0; Serial: 1215
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Tilt position - Middle, t=21.9 C, worst case extrapolation/Area Scan (51x111x1):

Measurement grid: dx=15mm, dy=15mm

Reference Value = 21 V/m; Power Drift = -0.01 dB

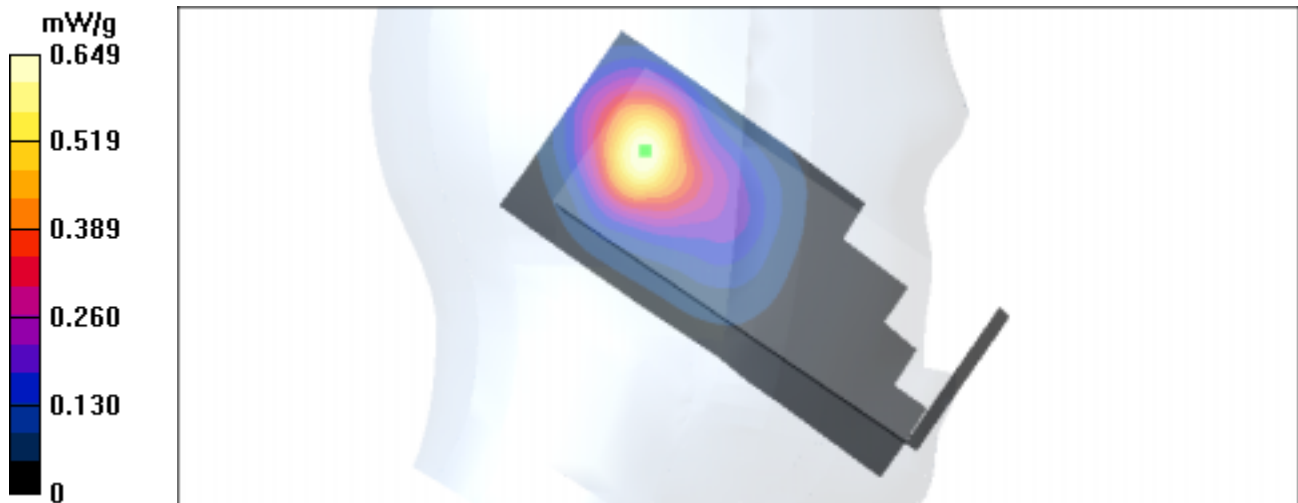
Maximum value of SAR (interpolated) = 0.649 mW/g

Tilt position - Middle, t=21.9 C, worst case extrapolation/Zoom Scan (5x5x7)**(5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 21 V/m; Power Drift = -0.01 dB

Maximum value of SAR (measured) = 0.657 mW/g

Peak SAR (extrapolated) = 1.2 W/kg

SAR(1 g) = 0.611 mW/g; SAR(10 g) = 0.339 mW/g

Date/Time: 06/16/04 15:27:29

Test Laboratory: TCC Oulu

DUT: RA-2; Serial: 004400/41/170551/8; with MMC card

Communication System: WLAN; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: HSL2450 Medium parameters used (interpolated): $f = 2412$ MHz; $\sigma = 1.83$ mho/m; $\epsilon_r = 37.7$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1765; ConvF(4.8, 4.8, 4.8); Calibrated: 16.02.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn555; Calibrated: 10.02.2004
- Phantom: SAM 2; Type: SAM 4.0; Serial: 1272
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Touch position - Low, t=21.9 C, worst case extrapolation/Area Scan (51x111x1):

Measurement grid: dx=15mm, dy=15mm

Reference Value = 4.8 V/m; Power Drift = -0.2 dB

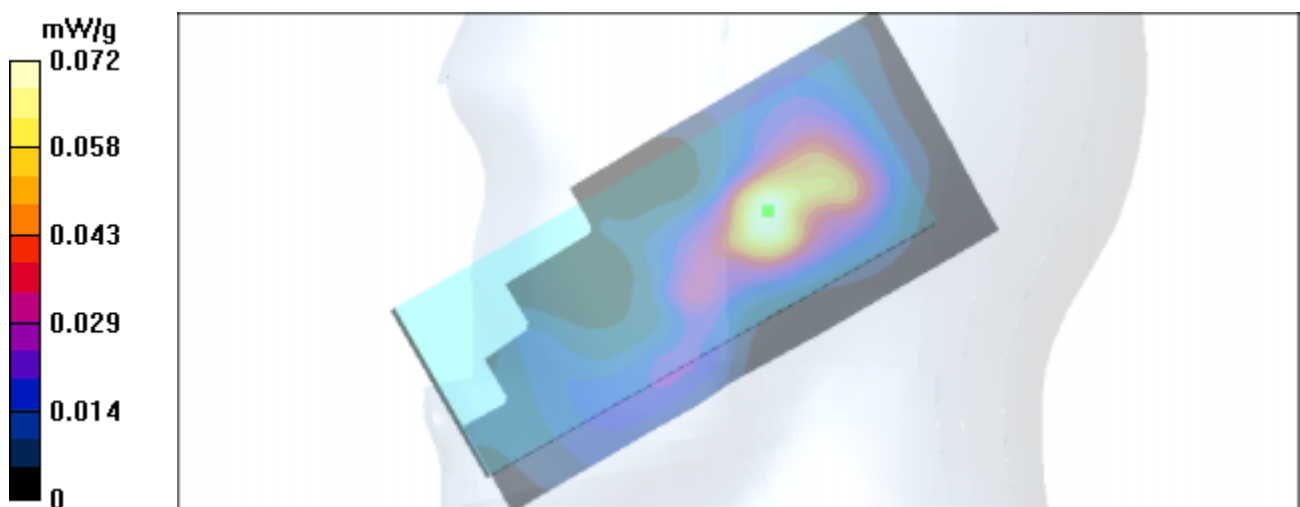
Maximum value of SAR (interpolated) = 0.072 mW/g

[Info: Interpolated medium parameters used for SAR evaluation!](#)**Touch position - Low, t=21.9 C, worst case extrapolation/Zoom Scan (7x7x7)****(7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.8 V/m; Power Drift = -0.2 dB

Maximum value of SAR (measured) = 0.068 mW/g

Peak SAR (extrapolated) = 0.131 W/kg

SAR(1 g) = 0.064 mW/g; SAR(10 g) = 0.033 mW/g[Info: Interpolated medium parameters used for SAR evaluation!](#)

Date/Time: 06/16/04 13:56:34

Test Laboratory: TCC Oulu

DUT: RA-2; Serial: 004400/41/170551/8

Communication System: WLAN; Frequency: 2442 MHz; Duty Cycle: 1:1

Medium: HSL2450 Medium parameters used (interpolated): $f = 2442$ MHz; $\sigma = 1.87$ mho/m; $\epsilon_r = 37.5$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1765; ConvF(4.8, 4.8, 4.8); Calibrated: 16.02.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn555; Calibrated: 10.02.2004
- Phantom: SAM 2; Type: SAM 4.0; Serial: 1272
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Tilt position - Middle, $t=22.2$ C, worst case extrapolation/Area Scan (51x111x1):Measurement grid: $dx=15$ mm, $dy=15$ mm

Reference Value = 5.3 V/m; Power Drift = 0.3 dB

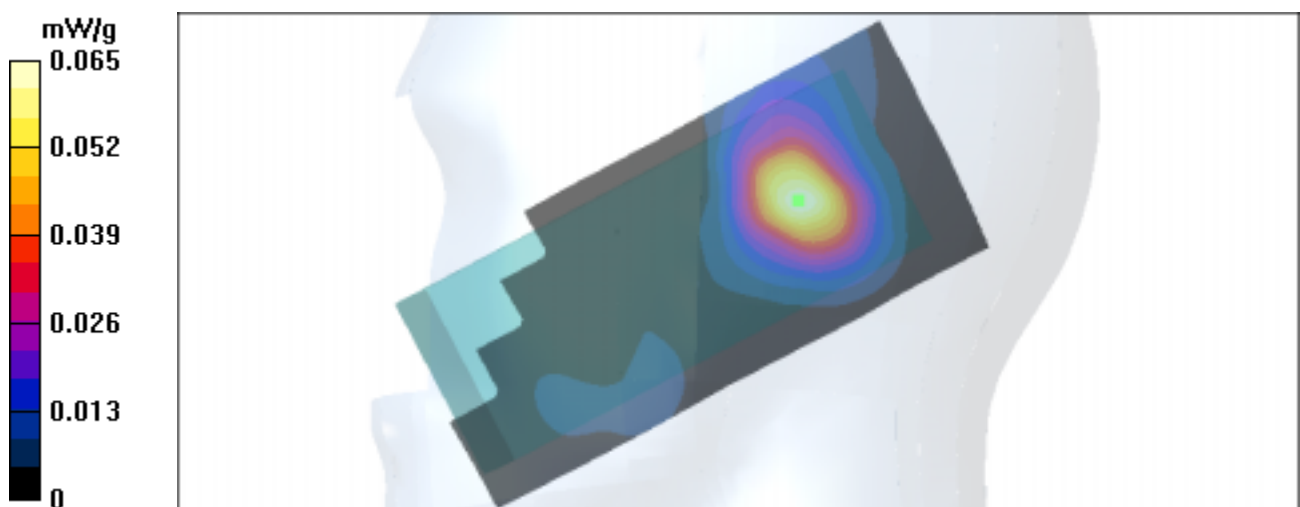
Maximum value of SAR (interpolated) = 0.065 mW/g

[Info: Interpolated medium parameters used for SAR evaluation!](#)**Tilt position - Middle, $t=22.2$ C, worst case extrapolation/Zoom Scan (7x7x7)****(7x7x7)/Cube 0:** Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 5.3 V/m; Power Drift = 0.3 dB

Maximum value of SAR (measured) = 0.059 mW/g

Peak SAR (extrapolated) = 0.121 W/kg

SAR(1 g) = 0.056 mW/g; SAR(10 g) = 0.029 mW/g[Info: Interpolated medium parameters used for SAR evaluation!](#)

Date/Time: 06/16/04 12:44:48

Test Laboratory: TCC Oulu

DUT: RA-2; Serial: 004400/41/170551/8

Communication System: WLAN; Frequency: 2442 MHz; Duty Cycle: 1:1

Medium: HSL2450 Medium parameters used (interpolated): $f = 2442$ MHz; $\sigma = 1.87$ mho/m; $\epsilon_r =$ 37.5; $\rho = 1000$ kg/m³

Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1765; ConvF(4.8, 4.8, 4.8); Calibrated: 16.02.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn555; Calibrated: 10.02.2004
- Phantom: SAM 2; Type: SAM 4.0; Serial: 1272
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Touch position - Middle, $t=22.3$ C, worst case extrapolation/Area Scan (51x111x1):Measurement grid: $dx=15$ mm, $dy=15$ mm

Reference Value = 5.46 V/m; Power Drift = -0.3 dB

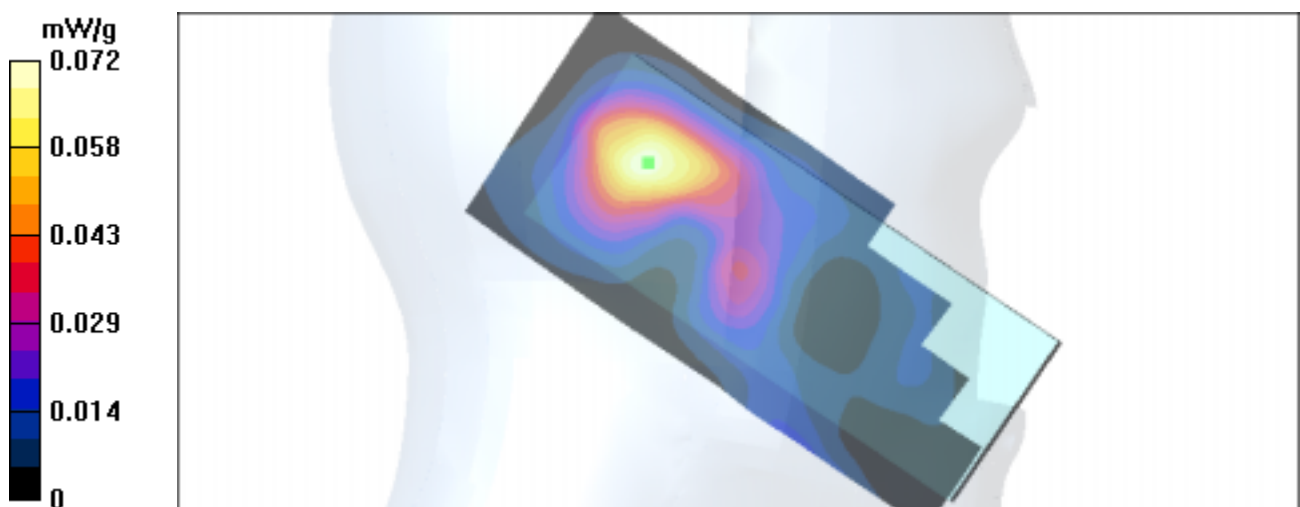
Maximum value of SAR (interpolated) = 0.072 mW/g

[Info: Interpolated medium parameters used for SAR evaluation!](#)**Touch position - Middle, $t=22.3$ C, worst case extrapolation/Zoom Scan (7x7x7)****(7x7x7)/Cube 0:** Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 5.46 V/m; Power Drift = -0.3 dB

Maximum value of SAR (measured) = 0.057 mW/g

Peak SAR (extrapolated) = 0.120 W/kg

SAR(1 g) = 0.053 mW/g; SAR(10 g) = 0.029 mW/g[Info: Interpolated medium parameters used for SAR evaluation!](#)

Date/Time: 06/16/04 12:44:48

Test Laboratory: TCC Oulu

DUT: RA-2; Serial: 004400/41/170551/8

Communication System: WLAN; Frequency: 2442 MHz; Duty Cycle: 1:1

Medium: HSL2450 Medium parameters used (interpolated): $f = 2442$ MHz; $\sigma = 1.87$ mho/m; $\epsilon_r =$ 37.5; $\rho = 1000$ kg/m³

Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1765; ConvF(4.8, 4.8, 4.8); Calibrated: 16.02.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn555; Calibrated: 10.02.2004
- Phantom: SAM 2; Type: SAM 4.0; Serial: 1272
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Tilt position - Middle, $t=22.3$ C, worst case extrapolation/Area Scan (51x111x1):Measurement grid: $dx=15$ mm, $dy=15$ mm

Reference Value = 5.2 V/m; Power Drift = -0.2 dB

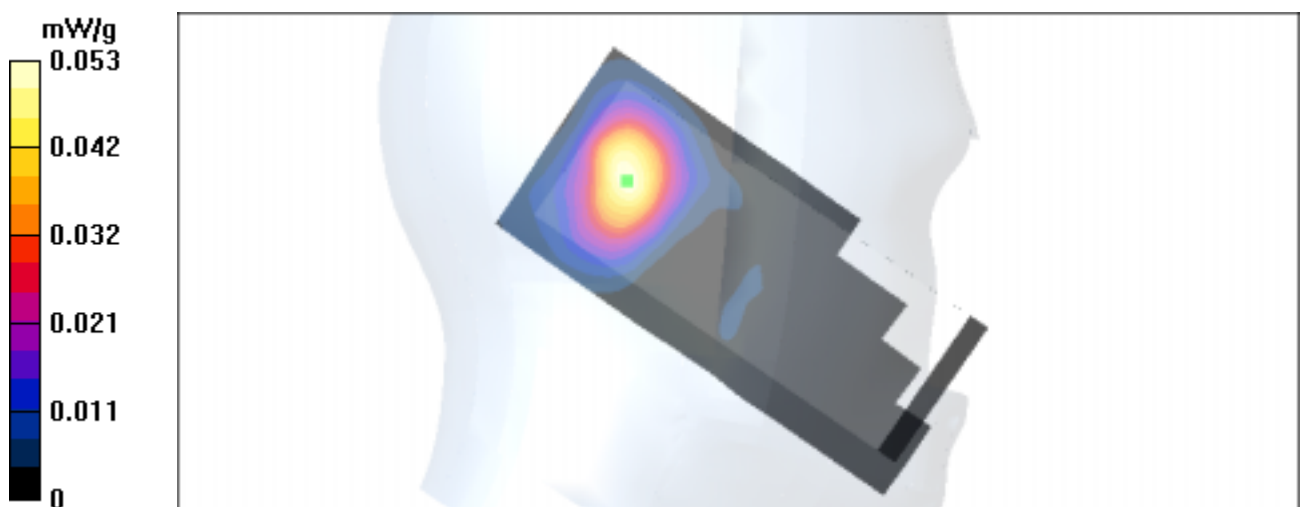
Maximum value of SAR (interpolated) = 0.053 mW/g

[Info: Interpolated medium parameters used for SAR evaluation!](#)**Tilt position - Middle, $t=22.3$ C, worst case extrapolation/Zoom Scan (7x7x7)****(7x7x7)/Cube 0:** Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 5.2 V/m; Power Drift = -0.2 dB

Maximum value of SAR (measured) = 0.055 mW/g

Peak SAR (extrapolated) = 0.113 W/kg

SAR(1 g) = 0.050 mW/g; SAR(10 g) = 0.025 mW/g[Info: Interpolated medium parameters used for SAR evaluation!](#)

Date/Time: 06/17/04 14:24:36

Test Laboratory: TCC Oulu

DUT: RA-2; Serial: 004400/41/170551/8; Headset: HS-3; with MMC card

Communication System: GPRS 1900; Frequency: 1909.8 MHz; Duty Cycle: 1:4.2

Medium: BSL1900 Medium parameters used (interpolated): $f = 1909.8$ MHz; $\sigma = 1.59$ mho/m; $\epsilon_r = 52.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1765; ConvF(4.59, 4.59, 4.59); Calibrated: 16.02.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn555; Calibrated: 10.02.2004
- Phantom: SAM 3; Type: SAM 4.0; Serial: 1215
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Body worn - High, $t=21.9$ C, worst case extrapolation/Area Scan (51x111x1):Measurement grid: $dx=15$ mm, $dy=15$ mm

Reference Value = 20.5 V/m; Power Drift = -0.0 dB

Maximum value of SAR (interpolated) = 1.31 mW/g

[Info: Interpolated medium parameters used for SAR evaluation!](#)**Body worn - High, $t=21.9$ C, worst case extrapolation/Zoom Scan (5x5x7)****(5x5x7)/Cube 0(lower):** Measurement grid: $dx=7.5$ mm, $dy=7.5$ mm, $dz=5$ mm

Reference Value = 20.5 V/m; Power Drift = -0.0 dB

Maximum value of SAR (measured) = 1.29 mW/g

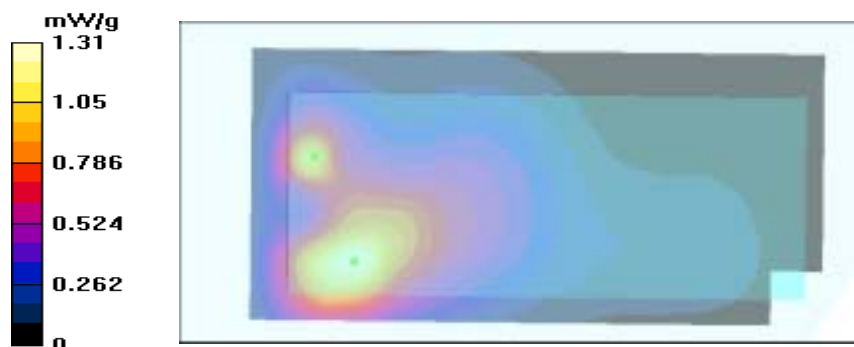
Peak SAR (extrapolated) = 2.7 W/kg

SAR(1 g) = 1.22 mW/g; SAR(10 g) = 0.640 mW/g[Info: Interpolated medium parameters used for SAR evaluation!](#)**Body worn - High, $t=21.9$ C, worst case extrapolation/Zoom Scan (5x5x7)****(5x5x7)/Cube 1(upper):** Measurement grid: $dx=7.5$ mm, $dy=7.5$ mm, $dz=5$ mm

Reference Value = 20.5 V/m; Power Drift = -0.0 dB

Maximum value of SAR (measured) = 1.08 mW/g

Peak SAR (extrapolated) = 2.41 W/kg

SAR(1 g) = 0.989 mW/g; SAR(10 g) = 0.468 mW/g[Info: Interpolated medium parameters used for SAR evaluation!](#)

Date/Time: 06/18/04 12:31:02

Test Laboratory: TCC Oulu

DUT: RA-2; Serial: 004400/41/170551/8; with MMC

Communication System: WLAN; Frequency: 2472 MHz; Duty Cycle: 1:1

Medium: BSL2450 Medium parameters used (interpolated): $f = 2472$ MHz; $\sigma = 2.09$ mho/m; $\epsilon_r = 52.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1765; ConvF(4.18, 4.18, 4.18); Calibrated: 16.02.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn555; Calibrated: 10.02.2004
- Phantom: SAM 3; Type: SAM 4.0; Serial: 1215
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Body worn - High, t=21.8 C, worst case extrapolation/Area Scan (51x111x1):

Measurement grid: dx=15mm, dy=15mm

Reference Value = 3.57 V/m; Power Drift = 0.1 dB

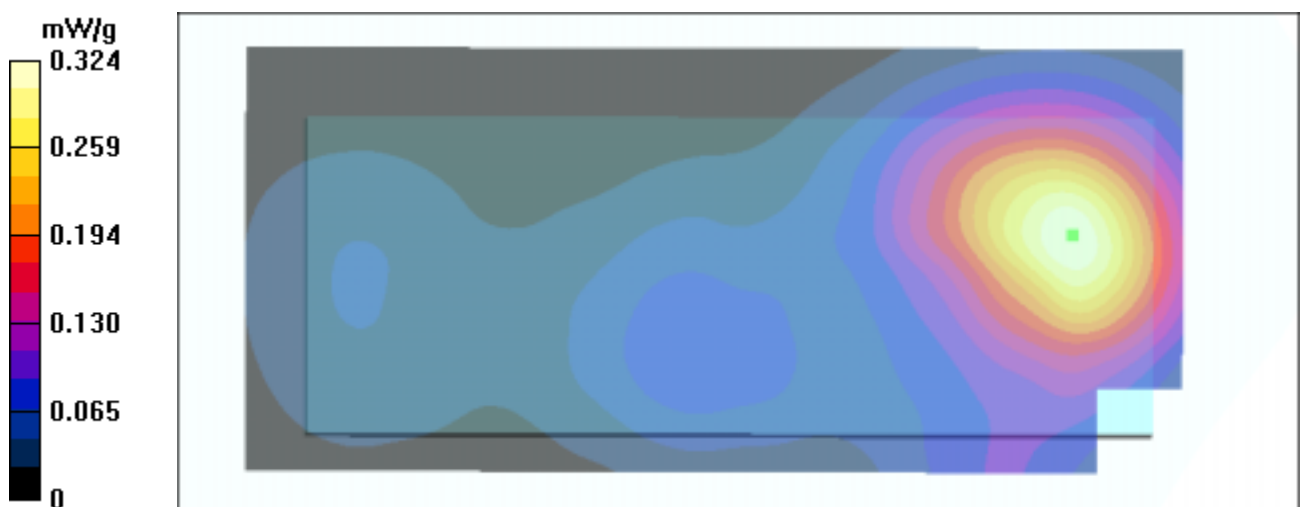
Maximum value of SAR (interpolated) = 0.324 mW/g

[Info: Interpolated medium parameters used for SAR evaluation!](#)**Body worn - High, t=21.8 C, worst case extrapolation/Zoom Scan (5x5x7)****(5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 3.57 V/m; Power Drift = 0.1 dB

Maximum value of SAR (measured) = 0.313 mW/g

Peak SAR (extrapolated) = 0.739 W/kg

SAR(1 g) = 0.305 mW/g; SAR(10 g) = 0.163 mW/g[Info: Interpolated medium parameters used for SAR evaluation!](#)

Date/Time: 06/15/04 16:17:58

Test Laboratory: TCC Oulu

DUT: RA-2; Serial: 004400/41/170551/8

Communication System: GSM 1900; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium: HSL1900 Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.4$ mho/m; $\epsilon_r =$ 38.9; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1765; ConvF(5.27, 5.27, 5.27); Calibrated: 16.02.2004

- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)

- Electronics: DAE3 Sn555; Calibrated: 10.02.2004

- Phantom: SAM 3; Type: SAM 4.0; Serial: 1215

- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Tilt position - Low, t=22.1 C, worst case extrapolation/Area Scan (51x91x1):

Measurement grid: dx=15mm, dy=15mm

Reference Value = 25.5 V/m; Power Drift = -0.0 dB

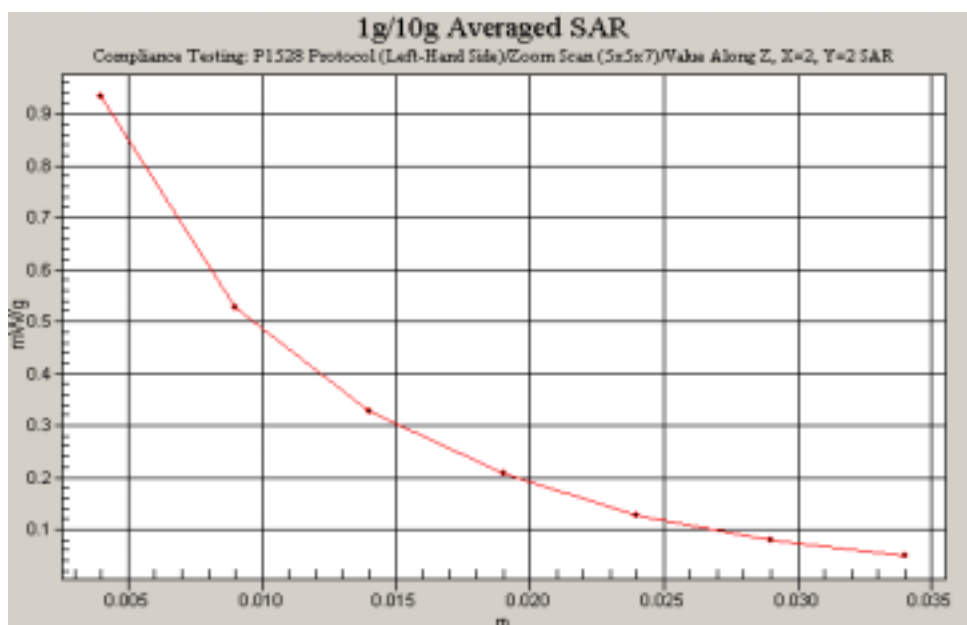
Maximum value of SAR (interpolated) = 0.960 mW/g

[Info: Interpolated medium parameters used for SAR evaluation!](#)**Tilt position - Low, t=22.1 C, worst case extrapolation/Zoom Scan (5x5x7)****(5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 25.5 V/m; Power Drift = -0.0 dB

Maximum value of SAR (measured) = 0.932 mW/g

Peak SAR (extrapolated) = 1.65 W/kg

SAR(1 g) = 0.863 mW/g; SAR(10 g) = 0.488 mW/g[Info: Interpolated medium parameters used for SAR evaluation!](#)

Date/Time: 06/16/04 15:27:29

Test Laboratory: TCC Oulu

DUT: RA-2; Serial: 004400/41/170551/8; with MMC card

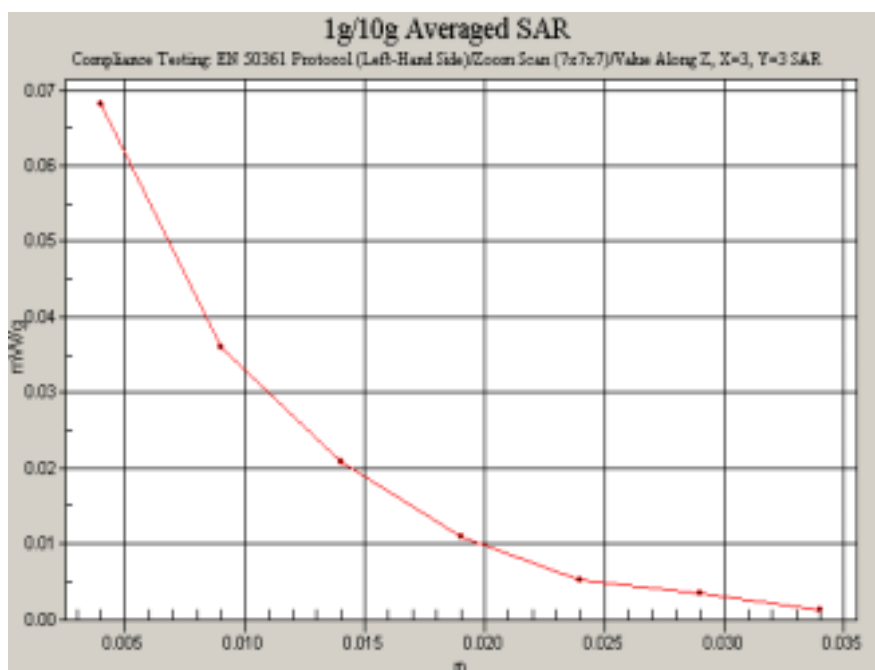
Communication System: WLAN; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: HSL2450 Medium parameters used (interpolated): $f = 2412 \text{ MHz}$; $\sigma = 1.83 \text{ mho/m}$; $\epsilon_r = 37.7$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1765; ConvF(4.8, 4.8, 4.8); Calibrated: 16.02.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn555; Calibrated: 10.02.2004
- Phantom: SAM 2; Type: SAM 4.0; Serial: 1272
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Touch position - Low, t=21.9 C, worst case extrapolation/Area Scan (51x111x1):Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$ Reference Value = 4.8 V/m ; Power Drift = -0.2 dB Maximum value of SAR (interpolated) = 0.072 mW/g [Info: Interpolated medium parameters used for SAR evaluation!](#)**Touch position - Low, t=21.9 C, worst case extrapolation/Zoom Scan (7x7x7)****(7x7x7)/Cube 0:** Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$ Reference Value = 4.8 V/m ; Power Drift = -0.2 dB Maximum value of SAR (measured) = 0.068 mW/g Peak SAR (extrapolated) = 0.131 W/kg **SAR(1 g) = 0.064 mW/g ; SAR(10 g) = 0.033 mW/g** [Info: Interpolated medium parameters used for SAR evaluation!](#)

Date/Time: 06/17/04 14:24:36

Test Laboratory: TCC Oulu

DUT: RA-2; Serial: 004400/41/170551/8; Headset: HS-3; with MMC card

Communication System: GPRS 1900; Frequency: 1909.8 MHz; Duty Cycle: 1:4.2

Medium: BSL1900 Medium parameters used (interpolated): $f = 1909.8$ MHz; $\sigma = 1.59$ mho/m; $\epsilon_r = 52.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1765; ConvF(4.59, 4.59, 4.59); Calibrated: 16.02.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn555; Calibrated: 10.02.2004
- Phantom: SAM 3; Type: SAM 4.0; Serial: 1215
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Body worn - High, t=21.9 C, worst case extrapolation/Area Scan (51x111x1):

Measurement grid: dx=15mm, dy=15mm

Reference Value = 20.5 V/m; Power Drift = -0.0 dB

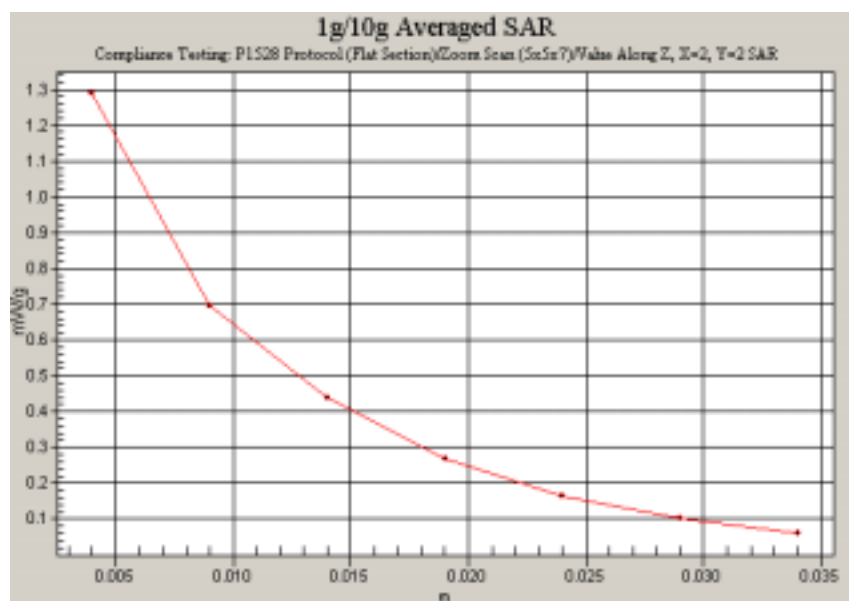
Maximum value of SAR (interpolated) = 1.31 mW/g

[Info: Interpolated medium parameters used for SAR evaluation!](#)**Body worn - High, t=21.9 C, worst case extrapolation/Zoom Scan (5x5x7)****(5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 20.5 V/m; Power Drift = -0.0 dB

Maximum value of SAR (measured) = 1.29 mW/g

Peak SAR (extrapolated) = 2.7 W/kg

SAR(1 g) = 1.22 mW/g; SAR(10 g) = 0.640 mW/g[Info: Interpolated medium parameters used for SAR evaluation!](#)

Date/Time: 06/18/04 12:31:02

Test Laboratory: TCC Oulu

DUT: RA-2; Serial: 004400/41/170551/8; with MMC card

Communication System: WLAN; Frequency: 2472 MHz; Duty Cycle: 1:1

Medium: BSL2450 Medium parameters used (interpolated): $f = 2472$ MHz; $\sigma = 2.09$ mho/m; $\epsilon_r = 52.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1765; ConvF(4.18, 4.18, 4.18); Calibrated: 16.02.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn555; Calibrated: 10.02.2004
- Phantom: SAM 3; Type: SAM 4.0; Serial: 1215
- Measurement SW: DASY4, V4.2 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 112

Body worn - High, $t=21.8$ C, worst case extrapolation/Area Scan (51x111x1):Measurement grid: $dx=15$ mm, $dy=15$ mm

Reference Value = 3.57 V/m; Power Drift = 0.1 dB

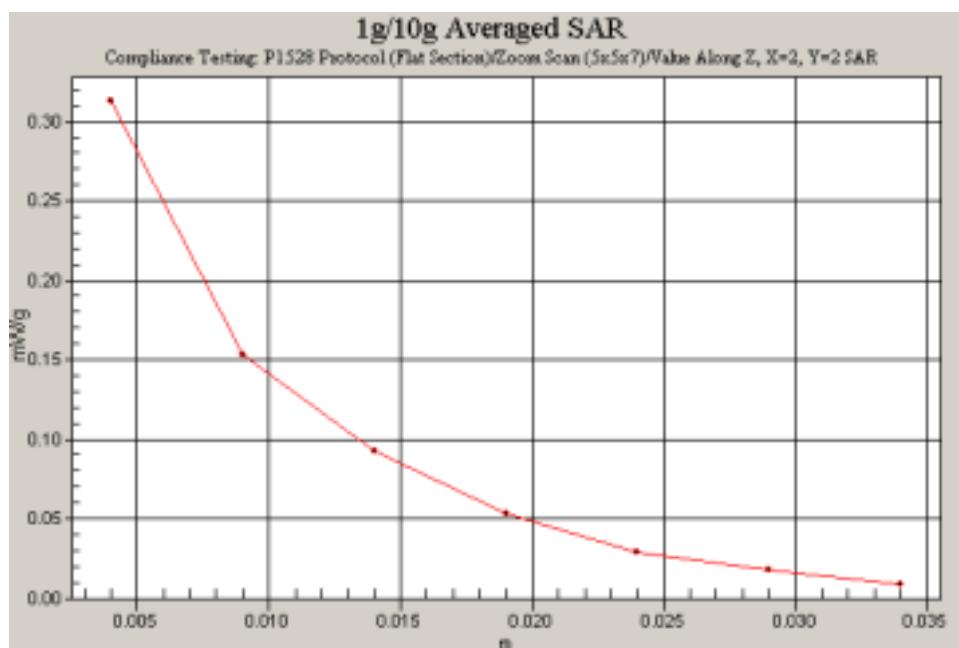
Maximum value of SAR (interpolated) = 0.324 mW/g

[Info: Interpolated medium parameters used for SAR evaluation!](#)**Body worn - High, $t=21.8$ C, worst case extrapolation/Zoom Scan (5x5x7)****(5x5x7)/Cube 0:** Measurement grid: $dx=7.5$ mm, $dy=7.5$ mm, $dz=5$ mm

Reference Value = 3.57 V/m; Power Drift = 0.1 dB

Maximum value of SAR (measured) = 0.313 mW/g

Peak SAR (extrapolated) = 0.739 W/kg

SAR(1 g) = 0.305 mW/g; SAR(10 g) = 0.163 mW/g[Info: Interpolated medium parameters used for SAR evaluation!](#)

APPENDIX C: PROBE CALIBRATION REPORT(S)

Client **Nokia Oulu**

CALIBRATION CERTIFICATE

Object(s) **ET3DV6 - SN:1765**

Calibration procedure(s) **QA CAL-01.v2**
Calibration procedure for dosimetric E-field probes

Calibration date: **February 16, 2004**

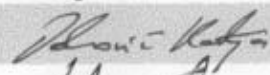
Condition of the calibrated item **In Tolerance (according to the specific calibration document)**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E4419B	GB41293874	2-Apr-03 (METAS, No 252-0250)	Apr-04
Power sensor E4412A	MY41495277	2-Apr-03 (METAS, No 252-0250)	Apr-04
Reference 20 dB Attenuator	SN: 5086 (20b)	3-Apr-03 (METAS, No. 251-0340)	Apr-04
Fluke Process Calibrator Type 702	SN: 6295803	8-Sep-03 (Sintrel SCS No. E-030020)	Sep-04
Power sensor HP 8481A	MY41092180	18-Sep-02 (SPEAG, in house check Oct-03)	In house check: Oct 05
RF generator HP 8684C	US3642U01700	4-Aug-99 (SPEAG, in house check Aug-02)	In house check: Aug-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-03)	In house check: Oct 05

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Laboratory Director	
Approved by:	Niels Kuster	Quality Manager	

Date issued: February 16, 2004

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

DASY - Parameters of Probe: ET3DV6 SN:1765

Sensitivity in Free Space

NormX	1.64 $\mu\text{V}/(\text{V}/\text{m})^2$
NormY	1.85 $\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	1.92 $\mu\text{V}/(\text{V}/\text{m})^2$

Diode Compression^A

DCP X	94	mV
DCP Y	94	mV
DCP Z	94	mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 7.

Boundary Effect

Head 900 MHz Typical SAR gradient: 5 % per mm

Sensor Cener to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	10.6	5.8
SAR _{be} [%]	With Correction Algorithm	0.3	0.6

Head 1800 MHz Typical SAR gradient: 10 % per mm

Sensor to Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	13.4	8.8
SAR _{be} [%]	With Correction Algorithm	0.2	0.1

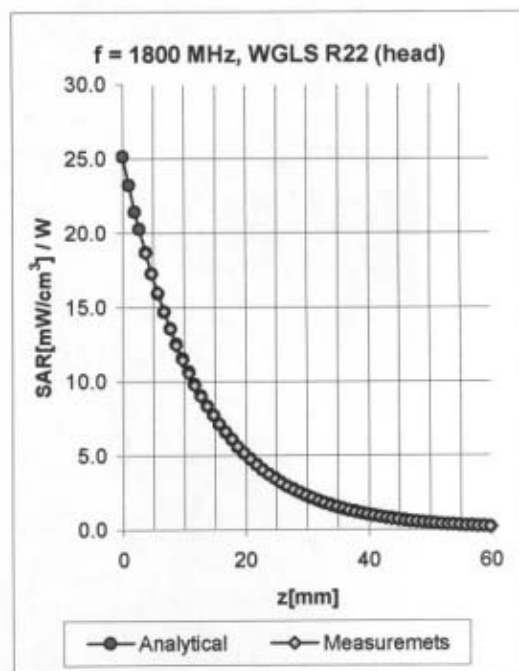
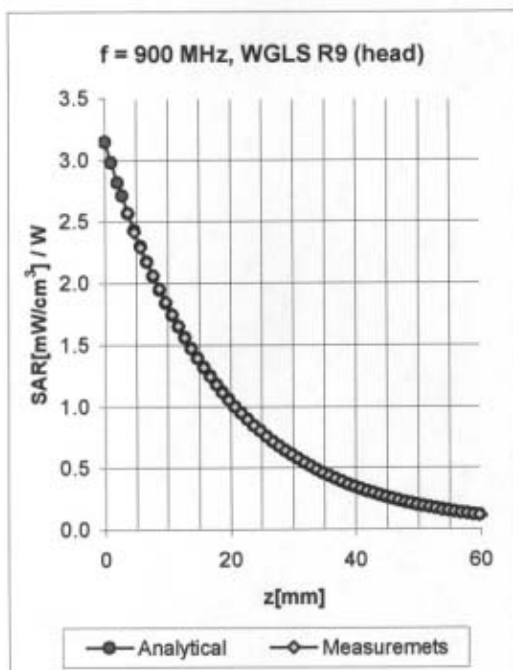
Sensor Offset

Probe Tip to Sensor Center	2.7 mm
Optical Surface Detection	in tolerance

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^A numerical linearization parameter; uncertainty not required

Conversion Factor Assessment



f [MHz]	Validity [MHz] ^B	Tissue	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
835	793-877	Head	41.5 ± 5%	0.90 ± 5%	0.68	1.81	6.55 ± 9.5% (k=2)
900	855-945	Head	41.5 ± 5%	0.97 ± 5%	0.44	2.37	6.45 ± 9.6% (k=2)
1800	1710-1890	Head	40.0 ± 5%	1.40 ± 5%	0.55	2.42	5.27 ± 10.9% (k=2)
1880	1786-1974	Head	40.0 ± 5%	1.40 ± 5%	0.56	2.58	5.24 ± 11.0% (k=2)
2450	2400-2500	Head	39.2 ± 5%	1.80 ± 5%	1.07	1.81	4.80 ± 9.7% (k=2)
835	793-877	Body	55.2 ± 5%	0.97 ± 5%	0.43	2.38	6.23 ± 9.5% (k=2)
900	855-945	Body	55.0 ± 5%	1.05 ± 5%	0.47	2.29	6.02 ± 9.6% (k=2)
1800	1710-1890	Body	53.3 ± 5%	1.52 ± 5%	0.63	2.56	4.65 ± 10.9% (k=2)
1880	1786-1974	Body	53.3 ± 5%	1.52 ± 5%	0.64	2.64	4.59 ± 11.0% (k=2)
2450	2400-2500	Body	52.7 ± 5%	1.95 ± 5%	1.65	1.35	4.18 ± 9.7% (k=2)

^B The total standard uncertainty is calculated as root-sum-square of standard uncertainty of the Conversion Factor at calibration frequency and the standard uncertainty for the indicated frequency band.

APPENDIX D: DIPOLE VALIDATION KIT REPORT(S)

Client **Nokia Oyj, Oulu**

CALIBRATION CERTIFICATE

Object(s) **D1900V2 - SN:5d030**

Calibration procedure(s) **QA CAL-05.v2
Calibration procedure for dipole validation kits**

Calibration date: **April 8, 2003**

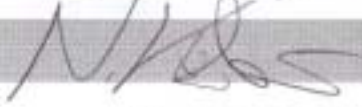
Condition of the calibrated item **In Tolerance (according to the specific calibration document)**

This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 ± 2 degrees Celsius and humidity $< 75\%$.

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date	Scheduled Calibration
RF generator R&S SML-03	100698	27-Mar-2002	In house check: Mar-05
Power sensor HP 8481A	MY41092317	18-Oct-02	Oct-04
Power sensor HP 8481A	US37292783	30-Oct-02	Oct-03
Power meter EPM E442	GB37480704	30-Oct-02	Oct-03
Network Analyzer HP 8753E	US38432426	3-May-00	In house check: May 03

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Laboratory Director	
Approved by:	Niels Kuster	Quality Manager	

Date issued: April 11, 2003

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 international Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

Date/Time: 04/01/03 15:53:35

Test Laboratory: SPEAG, Zurich, Switzerland

File Name: [SN5d030_SN1507_HSL1900_010403.da4](#)**DUT: Dipole 1900 MHz; Serial: D1900V2 - SN5d030****Program: Dipole Calibration**

Communication System: CW-1900; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: HSL 1900 MHz; ($\sigma = 1.44$ mho/m, $\epsilon_r = 38.78$, $\rho = 1000$ kg/m³)

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(5.2, 5.2, 5.2); Calibrated: 1/18/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN411; Calibrated: 1/16/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: DASY4, V4.1 Build 33; Postprocessing SW: SEMCAD, V1.6 Build 109

Pin = 250 mW; d = 10 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm**Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.5 V/m

Peak SAR = 18.4 W/kg

SAR(1 g) = 10.5 mW/g; SAR(10 g) = 5.42 mW/g

Power Drift = 0.03 dB



Date/Time: 04/08/03 14:15:07

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN5d030_SN1507_M1900_080403.da4

DUT: Dipole 1900 MHz; Serial: D1900V2 - SN5d030
Program: Dipole Calibration

Communication System: CW-1900; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: Muscle 1900 MHz; ($\sigma = 1.59 \text{ mho/m}$, $\epsilon_r = 51.2$, $\rho = 1000 \text{ kg/m}^3$)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(4.8, 4.8, 4.8); Calibrated: 1/18/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN411; Calibrated: 1/16/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: DASY4, V4.1 Build 33; Postprocessing SW: SEMCAD, V1.6 Build 109

Pin = 250 mW; d = 10 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm

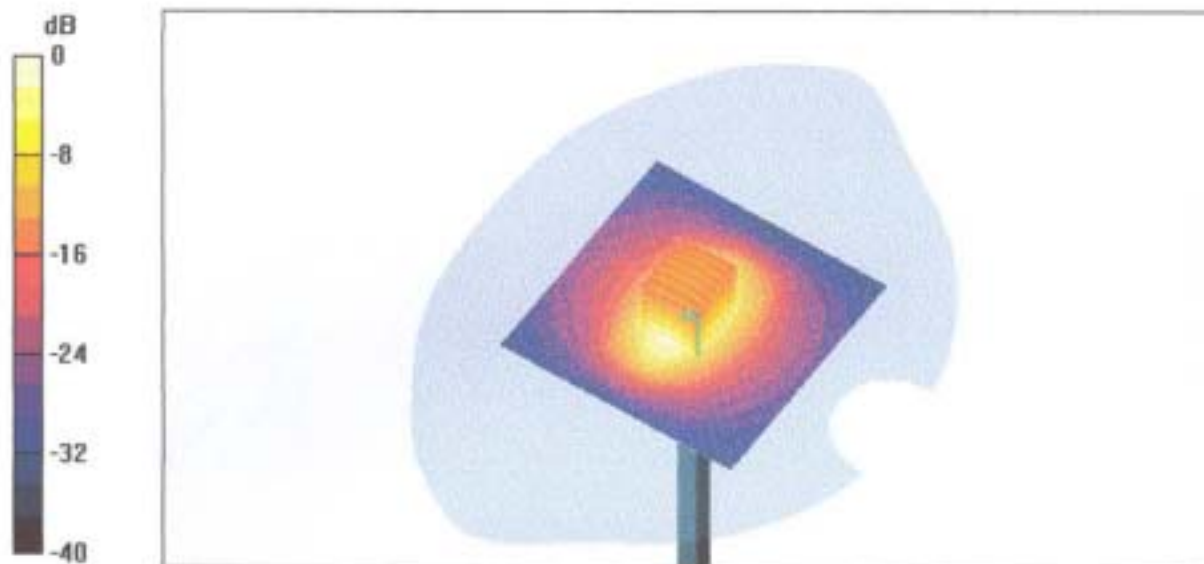
Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 91.4 V/m

Peak SAR = 18.7 W/kg

SAR(1 g) = 10.7 mW/g; SAR(10 g) = 5.52 mW/g

Power Drift = 0.03 dB



Client **Nokia Oyj, Oulu**

CALIBRATION CERTIFICATE

Object(s) **D2450V2 - SN:729**

Calibration procedure(s) **QA CAL-05.v2
Calibration procedure for dipole validation kits**

Calibration date: **April 17, 2003**

Condition of the calibrated item **In Tolerance (according to the specific calibration document)**

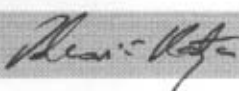
This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date	Scheduled Calibration
RF generator R&S SML-03	100698	27-Mar-2002	In house check: Mar-05
Power sensor HP 8481A	MY41092317	18-Oct-02	Oct-04
Power sensor HP 8481A	US37292783	30-Oct-02	Oct-03
Power meter EPM E442	GB37480704	30-Oct-02	Oct-03
Network Analyzer HP 8753E	US38432426	3-May-00	In house check: May 03

Calibrated by:	Name Nico Vetterli	Function Technician	Signature 
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Approved by:	Katja Pokovic	Laboratory Director	
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Date issued: April 17, 2003

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

Date/Time: 04/17/03 11:21:54

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN729_SN3013_HSL2450_170403.da4

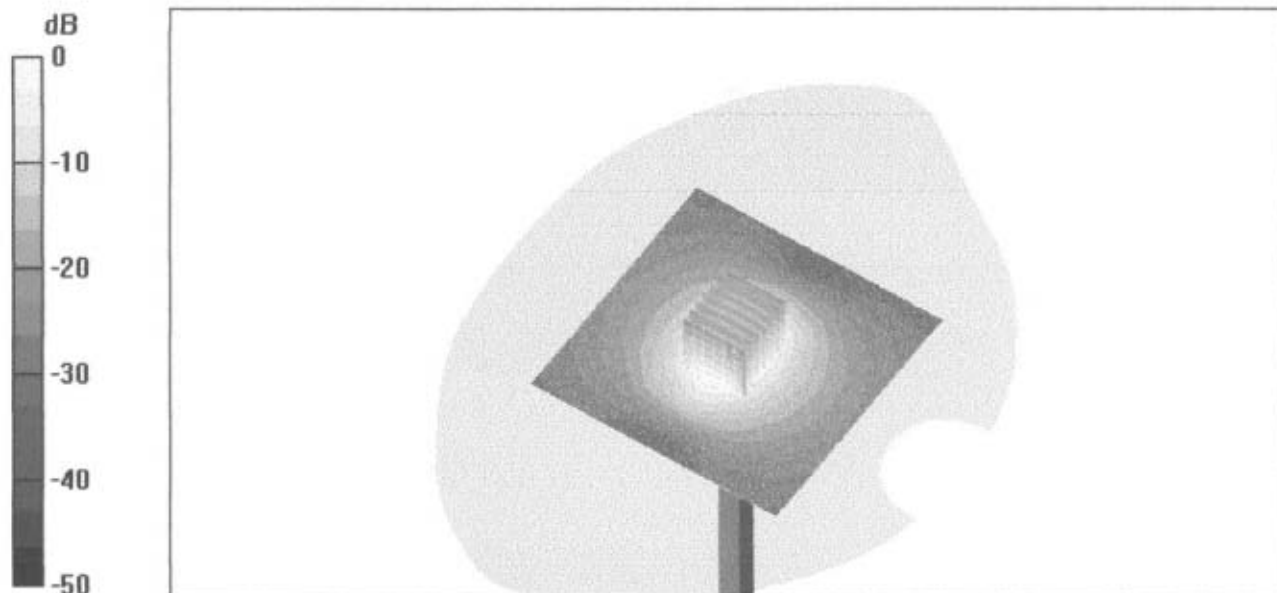
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN729
Program: Dipole Calibration

Communication System: CW-2450; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL 2450 MHz ($\sigma = 1.84$ mho/m, $\epsilon_r = 37.29$, $\rho = 1000$ kg/m³)
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV2 - SN3013; ConvF(4.8, 4.8, 4.8); Calibrated: 1/19/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN411; Calibrated: 1/16/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: DASY4, V4.1 Build 41; Postprocessing SW: SEMCAD, V1.6 Build 109

Pin = 250 mW; d = 10 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 92.6 V/m
Peak SAR = 29.5 W/kg
SAR(1 g) = 13.9 mW/g; SAR(10 g) = 6.2 mW/g
Power Drift = -0.01 dB



Date/Time: 04/17/03 16:52:30

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN729_SN3013_M2450_170403.da4

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN729
Program: Dipole Calibration

Communication System: CW-2450; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: Muscle 2450 MHz ($\sigma = 1.97$ mho/m, $\epsilon_r = 50.47$, $\rho = 1000$ kg/m³)

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV2 - SN3013; ConvF(4.2, 4.2, 4.2); Calibrated: 1/19/2003
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN411; Calibrated: 1/16/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006
- Measurement SW: DASY4, V4.1 Build 41; Postprocessing SW: SEMCAD, V1.6 Build 109

Pin = 250 mW; d = 10 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 90.9 V/m

Peak SAR = 27.2 W/kg

SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.32 mW/g

Power Drift = 0.02 dB

