

SAR Compliance Test Report

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Testing has been carried out in accordance with:	<p>47CFR §2.1093 Radiofrequency Radiation Exposure Evaluation: Portable Devices</p> <p>FCC OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01) Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields</p> <p>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</p> <p>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</p>		
Documentation:	The documentation of the testing performed on the tested devices is archived for 15 years at TCC Nokia.		
Test results:	<p>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.</p>		
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1. SUMMARY OF SAR TEST REPORT

1.1 Test Details

Period of test	2010-11-03
SN, HW and SW numbers of tested device	SN: 353759/04/002344/6, HW: 0500 ES6.2, SW: 012.006, DUT: 15338
Batteries used in testing	BL-5CT, DUT: 15335, 15336, 15337
Headsets used in testing	WH-102, DUT: 15334
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 standards when the maximum measured SAR value is less than or equal to the limit.

1.2.1 Head Configuration

Mode	Ch / f(MHz)	Conducted power	Position	Measured SAR value (1g avg)	Scaled* SAR value (1g avg)	SAR limit (1g avg)	Result
3-slot GPRS850**	251/848.8	30.2 dBm	Left, Tilt	0.576 W/kg	0.65 W/kg	1.6 W/kg	PASSED
WCDMA850**	4233/846.6	23.5 dBm	Left, Tilt	0.393 W/kg	0.44 W/kg	1.6 W/kg	PASSED
WCDMA1700/2100**	1513/1752.6	22.0 dBm	Left, Tilt	0.779 W/kg	0.87 W/kg	1.6 W/kg	PASSED
4-slot GPRS1900**	810/1909.8	24.5 dBm	Left, Tilt	0.976 W/kg	1.09 W/kg	1.6 W/kg	PASSED
WCDMA1900**	9262/1852.4	21.5 dBm	Left, Tilt	0.985 W/kg	1.10 W/kg	1.6 W/kg	PASSED
WLAN2450	7/2442.0	17.0 dBm	Right, Cheek	0.248 W/kg	0.28 W/kg	1.6 W/kg	PASSED
3-slot GPRS850 + WLAN2450	-	-	Left, Tilt	0.690 W/kg	0.77 W/kg	1.6 W/kg	PASSED
WCDMA850 + WLAN2450	-	-	Left, Tilt	0.530 W/kg	0.59 W/kg	1.6 W/kg	PASSED
WCDMA1700/2100 + WLAN2450	-	-	Left, Tilt	0.808 W/kg	0.90 W/kg	1.6 W/kg	PASSED
4-slot GPRS1900 + WLAN2450	-	-	Left, Tilt	0.986 W/kg	1.10 W/kg	1.6 W/kg	PASSED
WCDMA1900 + WLAN2450	-	-	Left, Tilt	0.994 W/kg	1.11 W/kg	1.6 W/kg	PASSED

1.2.2 Body Worn Configuration

Mode	Ch / f(MHz)	Conducted power	Separation distance	Measured SAR value (1g avg)	Scaled* SAR value (1g avg)	SAR limit (1g avg)	Result
3-slot GPRS850**	251/848.8	30.2 dBm	1.5 cm	1.08 W/kg	1.21 W/kg	1.6 W/kg	PASSED
WCDMA850**	4233/846.6	23.5 dBm	1.5 cm	0.744 W/kg	0.83 W/kg	1.6 W/kg	PASSED
WCDMA1700/2100**	1513/1752.6	22.0 dBm	1.5 cm	0.303 W/kg	0.34 W/kg	1.6 W/kg	PASSED
4-slot GPRS1900**	810/1909.8	24.5 dBm	1.5 cm	0.342 W/kg	0.38 W/kg	1.6 W/kg	PASSED
WCDMA1900**	9262/1852.4	21.5 dBm	1.5 cm	0.358 W/kg	0.40 W/kg	1.6 W/kg	PASSED
WLAN2450	7/2442.0	17.0 dBm	1.5 cm	0.109 W/kg	0.12 W/kg	1.6 W/kg	PASSED
3-slot GPRS850 + WLAN2450	-	-	1.5 cm	1.13 W/kg	1.27 W/kg	1.6 W/kg	PASSED
WCDMA850 + WLAN2450	-	-	1.5 cm	0.811 W/kg	0.91 W/kg	1.6 W/kg	PASSED
WCDMA1700/2100 + WLAN2450	-	-	1.5 cm	0.360 W/kg	0.40 W/kg	1.6 W/kg	PASSED
4-slot GPRS1900 + WLAN2450	-	-	1.5 cm	0.398 W/kg	0.45 W/kg	1.6 W/kg	PASSED
WCDMA1900 + WLAN2450	-	-	1.5 cm	0.422 W/kg	0.47 W/kg	1.6 W/kg	PASSED

* SAR values are scaled up by 12% to cover measurement drift. As a consequence of this upwards correction of the SAR values, the contribution of measurement drift to the overall measurement uncertainty (Section 6) is reduced to zero.

**SAR data taken from FCC_RM-601_01.

1.2.3 Maximum Drift

Maximum drift covered by 12% scaling up of the SAR values	Maximum drift during measurements
0.5dB	0.29 dB

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 4/8	824 – 849 1850 – 1910
EGPRS	850 1900	GMSK / 8PSK	1/8 to 4/8	824 – 849 1850 – 1910
WCDMA	850 (Band V) 1700/2100 (Band IV) 1900 (Band II)		1	826 – 847 1712 – 1753 1852 – 1908
HSUPA	850 (Band V) 1700/2100 (Band IV) 1900 (Band II)		1	826 – 847 1712 – 1753 1852 – 1908
BT	2450	GFSK	1	2402 – 2480
WLAN b-mode	2450	Up to 11Mbps QPSK	1	2412 – 2462
WLAN g-mode	2450	Up to 54Mbps 64QAM	1	2412 – 2462
WLAN n-mode	2450	Up to 72.2Mbps 64QAM	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.

2.1 Description of the Antenna

The device has internal antennas for both cellular and WLAN use. The cellular antenna is located at the top underneath the back cover. The WLAN antenna is located at the top underneath the back cover.

3. TEST CONDITIONS

3.1 Temperature and Humidity

Ambient temperature (°C):	20.9 to 23.5
Ambient humidity (RH %):	45 to 51

3.2 Test Signal, Frequencies and Output Power

The device was put into operation by using a control software for WLAN2450 testing.

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 transmission mode of the device in all WLAN b-mode tests was DSSS QPSK 11Mbps. This mode has the highest (or equal highest) time-averaged output power of all the WLAN b and g modulation modes in Nokia devices. In WLAN n-mode tests, BPSK 6.5Mbps with 20MHz bandwidth was used.

Some of the SAR results given in this report are taken from the earlier report FCC_RM-601_01.

3.3 Test Cases and Test Minimisation

The tested device examined in this report may not incorporate all of the features described in the text that follows, but its SAR evaluation will have been subjected to the same considerations and test logic described below.

Whilst it's possible to identify the maximum SAR test cases from inspection of the conducted power levels given in the Results tables (Section 7), different modes in the same band and multi-slot transmit GSM/GPRS modes can create some difficulties. Therefore the sequence of the SAR tests made in evaluating this device has used test logic that is based on measured SAR values. Comparison of measured SAR values in this way, can also allow some test minimization (i.e. test elimination) to be made.

For example, when SAR testing multi-slot GSM/GPRS/EGPRS modes, it is an inefficient use of test resources to fully SAR test every test configuration in each of the different modes as these modes have a fixed power relationship between them that is the same, irrespective of the test configuration. In the case of multi-slot GSM/GPRS modes, a single comparative SAR test - using

the same test channel and test configuration – is made in each of the n-slot modes; the mode with the highest measured SAR value is then subjected to full SAR testing in all test configurations. These comparative SAR tests (same frequency, same test configuration) are regarded as extremely accurate as they are relative tests in which the tested device changes neither its frequency nor its position between tests. For different modes that operate in the same band and use the same antenna e.g. GSM/GPRS850 and WCDMA850, full SAR testing is carried out in the GSM/GPRS850 mode but WCDMA850 testing is limited to 3 channel testing in the maximum SAR test configuration for GSM/GPRS850.

Multi-slot SAR testing against the Head is always performed whenever such a device offers Push to Talk over cellular with the internal earpiece active, Dual Transfer Mode (i.e. the ability to transmit voice and data simultaneously using the same transmitter) or has WLAN (which enables a Voice over IP call to take place whilst the device can simultaneously transmit data on a cellular band). Whenever a device has an intended multi-slot use against the head, it is also Head SAR tested in EGPRS mode. It should be noted that EGPRS transmit modes can have either GMSK or 8PSK modulation but, when tested, only 8PSK EGPRS will appear explicitly in the results tables, as GMSK EGPRS mode has identical time-averaged power to the reported GPRS mode.

Devices that have flips or slides are fully SAR tested in all device configurations consistent with their intended usage. For example, flip phones that can receive a call in closed mode are SAR tested against the head in both open and closed configurations. Similarly, slide phones are fully SAR tested in all slide configurations in which calls are intended to be made or received.

In the results tables in Section 7, the maximum SAR value for the ‘basic’ tests (i.e. left cheek, left tilt, right cheek and right tilt in Head SAR testing; with and without headset with the back &/or display side facing the flat phantom in Body SAR testing) is bolded for each band. In some cases, after full testing of the basic SAR test configurations has been completed, additional checking SAR tests are made. These checking tests are always based on the bolded result from the ‘basic’ testing. When the SAR value of a checking test exceeds the maximum value from the basic tests, it is also bolded and used as the basis for any further checking tests that might be needed.

Checking tests are largely voluntary and can cover optional batteries, different camera slide positions, optional covers, etc. In the case of optional batteries, if the construction of the optional battery is significantly different to the battery used in the full testing e.g. if the outer can is floating electrically rather than grounded, then the maximum SAR test configuration in each band is tested with the optional battery in 3 channels. For camera slides, if the slide material is metal, then checking tests in 3 channels are again run for the maximum SAR test configuration in each band. For plastic camera slides, SAR checking is only carried out in the channel that provided the maximum SAR value for the original. Optional front and back covers are tested if their shape differs significantly from the original or if their metallic content varies by more than 15% from the original; in the former case, the testing depends on the extent of

the physical differences, whereas in the latter case, 3 channel SAR testing is performed in every band in the max SAR test configuration.

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	793	12 months	2011-09
E-field Probe EX3DV4	3573	12 months	2010-11
Dipole Validation Kit, D2450V2	749	24 months	2011-10
DASY4 software	Version 4.7	-	-

Additional test equipment used in testing:

Test Equipment	Model	Serial Number	Calibration interval	Calibration expiry
Signal Generator	E4436B	US39260114	12 months	2011-08
Amplifier	5S1G4	25583	12 months	2011-08
Power Meter	NRVS	849305/028	12 months	2011-08
Power Sensor	NRV-Z32	825600/004	12 months	2011-08
Vector Network Analyzer	8753E	US38432928	12 months	2011-08
Dielectric Probe Kit	85070B	US33020420	-	-

4.1.1 Isotropic E-field Probe Type EX3DV4

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	Calibration certificate in Appendix C
Frequency	10 MHz to >6 GHz (dosimetry); Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 μ W/g to > 100 mW/g, Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm Tip length: 10 mm Body diameter: 12 mm Tip diameter: 2.5 mm Distance from probe tip to dipole centers: 1.0 mm
Application	General dosimetry up to 6 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 at least 15.0 cm measured from the ear reference point during system checking and device measurements.

4.3.1 Tissue Simulant Recipes

The following recipes were used for Head and Body tissue simulants:

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]	
2450	Reference result	13.2	39.1	1.78	21.0
	$\pm 10\%$ window	11.9 – 14.5			
	2010-11-03	14.2	37.3	1.84	

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]	
2442	Recommended value	39.2	1.79	
	\pm 5% window	37.3 – 41.2	1.70 – 1.88	
	2010-11-03	37.4	1.83	21.0

Body tissue simulant measurements

f [MHz]	Description	Dielectric Parameters		Temp [°C]
		ϵ_r	σ [S/m]	
2442	Recommended value	52.7	1.94	
	\pm 5% window	50.1 – 55.3	1.85 – 2.04	
	2010-11-03	50.6	2.01	21.0

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 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".

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 the

separation distance indicated in Section 1.2.2 using a separate flat spacer that was removed before the start of the measurements.

The device was oriented with its back facing the phantom since this orientation gives higher results.

5.3 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.

5.4 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 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	$\sqrt{3}$	$(1-c_p)^{1/2}$	± 1.9	∞
Hemispherical Isotropy	E2.2	± 9.6	R	$\sqrt{3}$	$(c_p)^{1/2}$	± 3.9	∞
Boundary Effect	E2.3	± 1.0	R	$\sqrt{3}$	1	± 0.6	∞
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	± 3.9	R	$\sqrt{3}$	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	$\sqrt{3}$	1	± 0.0	∞
Phantom and Tissue Parameters							
Phantom Uncertainty (shape and thickness tolerances)	E3.1	± 4.0	R	$\sqrt{3}$	1	± 2.3	∞
Conductivity Target - tolerance	E3.2	± 5.0	R	$\sqrt{3}$	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	$\sqrt{3}$	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**

Mode	Test configuration	SAR, averaged over 1g (W/kg)		
		Ch 128 824.2 MHz	Ch 190 836.6 MHz	Ch 251 848.8 MHz
GSM	Conducted Power	-	32.5 dBm	-
	Left	Cheek	-	0.237
		Tilt	-	-
	Right	Cheek	-	-
		Tilt	-	-
2-slot GPRS	Conducted Power	-	32.0 dBm	-
	Left	Cheek	-	0.409
		Tilt	-	-
	Right	Cheek	-	-
		Tilt	-	-
3-slot GPRS	Conducted Power	30.2 dBm	30.2 dBm	30.2 dBm
	Left	Cheek	-	0.410
		Tilt	0.428	0.472
	Right	Cheek	-	0.432
		Tilt	-	0.434
4-slot GPRS	Conducted Power	-	29.0dBm	-
	Left	Cheek	-	0.408
		Tilt	-	-
	Right	Cheek	-	-
		Tilt	-	-
3-slot 8PSK EGPRS	Conducted Power	-	-	26.2 dBm
	Left	Cheek	-	-
		Tilt	-	0.171
	Right	Cheek	-	-
		Tilt	-	-

850MHz Table continues

850MHz Table continues

Mode	Test configuration	SAR, averaged over 1g (W/kg)		
		Ch 4132 826.4 MHz	Ch 4175 835.0 MHz	Ch 4233 846.6 MHz
WCDMA	Conducted Power	23.5 dBm	23.5 dBm	23.5 dBm
	Left	Cheek	-	0.310
		Tilt	0.296	0.362
	Right	Cheek	-	0.341
		Tilt	-	0.343

1700/2100MHz Head SAR results**

Mode	Test configuration	SAR, averaged over 1g (W/kg)		
		Ch 1312 1712.4 MHz	Ch 1412 1732.4 MHz	Ch 1513 1752.6 MHz
WCDMA	Conducted Power	22.0 dBm	22.0 dBm	22.0 dBm
	Left	Cheek	-	0.545
		Tilt	0.536	0.727
	Right	Cheek	-	0.349
		Tilt	-	0.544

1900MHz Head SAR results**

Mode	Test configuration	SAR, averaged over 1g (W/kg)		
		Ch 512 1850.2 MHz	Ch 661 1880.0 MHz	Ch 810 1909.8 MHz
GSM	Conducted Power	-	30.5 dBm	-
	Left	Cheek	-	0.621
		Tilt	-	-
	Right	Cheek	-	-
		Tilt	-	-
2-slot GPRS	Conducted Power	-	27.5 dBm	-
	Left	Cheek	-	0.641
		Tilt	-	-
	Right	Cheek	-	-
		Tilt	-	-
3-slot GPRS	Conducted Power	-	25.5 dBm	-
	Left	Cheek	-	0.605
		Tilt	-	-
	Right	Cheek	-	-
		Tilt	-	-
4-slot GPRS	Conducted Power	24.5 dBm	24.5 dBm	24.5 dBm
	Left	Cheek	-	0.659
		Tilt	0.889	0.899
	Right	Cheek	-	0.464
		Tilt	-	0.679
4-slot 8PSK EGPRS	Conducted Power	-	-	24.0 dBm
	Left	Cheek	-	-
		Tilt	-	0.714
	Right	Cheek	-	-
		Tilt	-	-
Mode	Test configuration	SAR, averaged over 1g (W/kg)		
		Ch 9262 1852.4 MHz	Ch 9400 1880.0 MHz	Ch 9538 1907.6 MHz
WCDMA	Conducted Power	21.5 dBm	21.5 dBm	21.5 dBm
	Left	Cheek	-	0.548
		Tilt	0.985	0.771
	Right	Cheek	-	0.365
		Tilt	-	0.585

2450MHz Head SAR results

Mode	Test configuration	SAR, averaged over 1g (W/kg)		
		Ch 1 2412.0 MHz	Ch 7 2442.0 MHz	Ch 11 2462.0 MHz
WLAN b-mode	Conducted Power	17.0 dBm	17.0 dBm	17.0 dBm
	Left	Cheek	-	0.204
		Tilt	-	0.227
	Right	Cheek	0.110	0.248
		Tilt	-	0.202
WLAN n-mode 20MHz	Conducted Power	16.0 dBm	16.0 dBm	16.0 dBm
	Left	Cheek	-	-
		Tilt	-	-
	Right	Cheek	0.084	0.185
		Tilt	-	-

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

850MHz Body SAR results**

Mode	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
3-slot GPRS		Conducted Power	30.2 dBm	30.2 dBm	30.2 dBm
	Display facing phantom	Without headset	-	0.306	-
		Headset WH-102	-	0.217	-
	Back facing phantom	Without headset	0.858	0.991	1.08
		Headset WH-102	-	0.778	-
Mode	Device orientation	Test configuration	SAR, averaged over 1g (W/kg)		
			Ch 4132 826.4 MHz	Ch 4175 835.0 MHz	Ch 4233 846.6 MHz
WCDMA		Conducted Power	23.5 dBm	23.5 dBm	23.5 dBm
	Display facing phantom	Without headset	-	0.227	-
		Headset WH-102	-	0.171	-
	Back facing phantom	Without headset	0.560	0.677	0.744
		Headset WH-102	-	0.501	-

1700/2100MHz Body SAR results**

Mode	Device orientation	Test configuration	SAR, averaged over 1g (W/kg)		
			Ch 1312 1712.4 MHz	Ch 1412 1732.4 MHz	Ch 1513 1752.6 MHz
WCDMA		Conducted Power	22.0 dBm	22.0 dBm	22.0 dBm
	Display facing phantom	Without headset	-	0.123	-
		Headset WH-102	-	0.105	-
	Back facing phantom	Without headset	0.202	0.248	0.303
		Headset WH-102	-	0.224	-

1900MHz Body SAR results**

Mode	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
4-slot GPRS		Conducted Power	24.5 dBm	24.5 dBm	24.5 dBm
	Display facing phantom	Without headset	-	0.187	-
		Headset WH-102	-	0.165	-
	Back facing phantom	Without headset	0.307	0.340	0.342
		Headset WH-102	-	0.337	-
Mode	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		Conducted Power	21.5 dBm	21.5 dBm	21.5 dBm
	Display facing phantom	Without headset	-	0.163	-
		Headset WH-102	-	0.148	-
	Back facing phantom	Without headset	-	0.304	-
		Headset WH-102	0.358	0.309	0.304

2450MHz Body SAR results

Mode	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 b-mode		Conducted Power	17.0 dBm	17.0 dBm	17.0 dBm
	Display facing phantom	Without headset	-	-	-
		Headset WH-102	-	-	-
	Back facing phantom	Without headset	-	0.100	-
		Headset WH-102	0.044	0.109	0.045
WLAN n-mode 20MHz		Conducted Power	16.0 dBm	16.0 dBm	16.0 dBm
	Display facing phantom	Without headset	-	-	-
		Headset WH-102	-	-	-
	Back facing phantom	Without headset	-	-	-
		Headset WH-102	0.035	0.073	0.041

Simultaneous transmissions: Combined SAR results – Individual band Max results

Test configuration	Max. 1g SAR results					
	WLAN	3-slot GPRS850**	WCDMA 850**	WCDMA 1700/2100**	4-slot GPRS 1900**	WCDMA 1900**
Head: Left, Cheek	0.204	0.410	0.310	0.545	0.659	0.548
Head: Left, Tilt	0.227	0.576	0.393	0.779	0.976	0.985
Head: Right, Cheek	0.248	0.432	0.341	0.349	0.464	0.365
Head: Right, Tilt	0.202	0.434	0.343	0.544	0.679	0.585
Body: Without Headset	0.100	1.08	0.744	0.303	0.342	0.304
Body: Headset WH-102	0.109	0.778	0.501	0.224	0.337	0.358

Simultaneous transmissions: Combined SAR results – Max + Max combined results

Test configuration	Combined 1g SAR values				
	3-slot GPRS850 +WLAN	WCDMA 850 +WLAN	WCDMA 1700/2100 +WLAN	4-slot GPRS 1900 +WLAN	WCDMA 1900 +WLAN
Head: Left, Cheek	0.614	0.514	0.749	0.863	0.752
Head: Left, Tilt	0.803	0.620	1.006	1.203	1.212
Head: Right, Cheek	0.680	0.589	0.597	0.712	0.613
Head: Right, Tilt	0.636	0.545	0.746	0.881	0.787
Body: Without Headset	1.180	0.844	0.403	0.442	0.404
Body: Headset WH-102	0.887	0.610	0.333	0.446	0.467

**SAR data taken from FCC_RM-601_01

The following table gives a more accurate assessment of the SAR values for simultaneous transmission. These values have been calculated using the SPEAG Combined Multiband algorithm, which is based on area scans. It a) converts the 2D area scans into 3D volume scans by assuming frequency-dependent decay characteristics for the E-field, b) sums the SAR values for WLAN2450 and the cellular bands point-by-point and c) calculates the combined average SAR values. It is these values that appear in the summary tables in Section 1.2.

**Simultaneous transmissions: Combined SAR results –
SPEAG Combined Multiband algorithm results**

Test configuration	Combined 1g SAR values				
	3-slot GPRS850 +WLAN	WCDMA 850 +WLAN	WCDMA 1700/2100 +WLAN	4-slot GPRS 1900 +WLAN	WCDMA 1900 +WLAN
Head: Left, Cheek	-	-	-	-	-
Head: Left, Tilt	0.690	0.530	0.808	0.986	0.994
Head: Right, Cheek	-	-	-	-	-
Head: Right, Tilt	-	-	-	-	-
Body: Without Headset	1.13	0.811	0.360	-	-
Body: Headset WH-102	-	-	-	0.398	0.422

Some of the Combined SAR values in the above table are less than the maximum SAR values for the contributing cellular band. This is due to a) minimal overlap of the SAR distributions of the cellular band with WLAN2450 and b) uncertainties associated with the different methods of calculation. In these cases, the maximum SAR values given for the combined Modes in the Summary table in Section 1.2 are those for the individual cellular band.

Note: Simultaneous Transmission Procedures as described in KDB648474 are not required for this product. The Combined SAR data given in the tables above has been voluntarily calculated.

Plots of the Measurement scans are given in Appendix B.

APPENDIX A: SYSTEM CHECKING SCANS

Date/Time: 2010-11-03 10:04:45

Test Laboratory: TCC Nokia

Type: D2450V2; Serial: D2450V2 - SN:749

Communication System: CW2450

Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: HSL2450; Medium Notes: $t = 21.0 \text{ }^{\circ}\text{C}$

Medium parameters used: $f = 2450 \text{ MHz}$; $\sigma = 1.84 \text{ mho/m}$; $\epsilon_r = 37.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3573
- ConvF(6.56, 6.56, 6.56); Calibrated: 2009-11-20
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn793; Calibrated: 2010-09-08
- Phantom: SAM1; Type: SAM; Serial: TP-1126
- 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) = 18.0 mW/g

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

Reference Value = 91.6 V/m

Peak SAR (extrapolated) = 30.2 W/kg

SAR(1 g) = 14.2 mW/g

SAR(10 g) = 6.57 mW/g

Power Drift = 0.004 dB

Maximum value of SAR (measured) = 16.1 mW/g



APPENDIX B: MEASUREMENT SCANS

Date/Time: 2010-11-03 11:25:40

Test Laboratory: TCC Nokia

Type: RM-601; Serial: 353759/04/002344/6

Communication System: WLAN2450 b-mode

Frequency: 2442 MHz; Duty Cycle: 1:1

Medium: HSL2450; Medium Notes: $t = 21.0 \text{ C}$

Medium parameters used: $f = 2442 \text{ MHz}$; $\sigma = 1.83 \text{ mho/m}$; $\epsilon_r = 37.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3573
- ConvF(6.56, 6.56, 6.56); Calibrated: 2009-11-20
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn793; Calibrated: 2010-09-08
- Phantom: SAM1; Type: SAM; Serial: TP-1126
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Cheek - Middle/Area Scan (51x91x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.232 mW/g

Cheek - Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=7.5\text{mm}$, $dy=7.5\text{mm}$, $dz=5\text{mm}$

Reference Value = 8.25 V/m

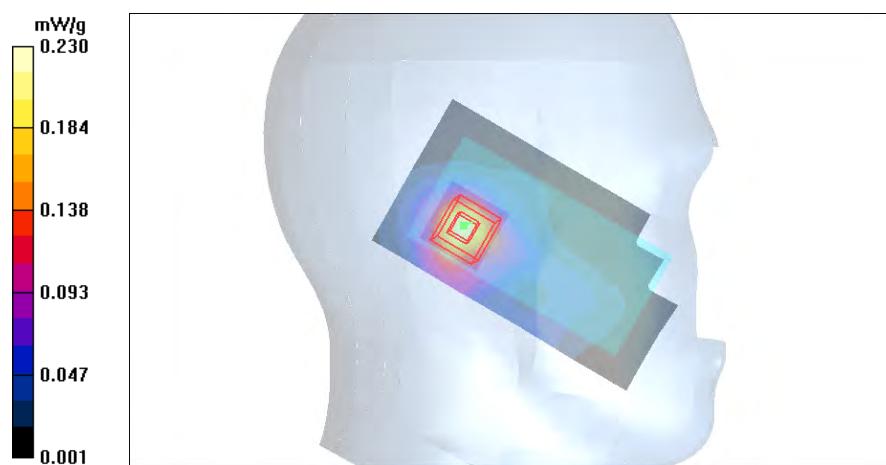
Peak SAR (extrapolated) = 0.373 W/kg

SAR(1 g) = 0.204 mW/g

SAR(10 g) = 0.105 mW/g

Power Drift = -0.077 dB

Maximum value of SAR (measured) = 0.230 mW/g



Date/Time: 2010-11-03 11:46:18

Test Laboratory: TCC Nokia

Type: RM-601; Serial: 353759/04/002344/6

Communication System: WLAN2450 b-mode

Frequency: 2442 MHz; Duty Cycle: 1:1

Medium: HSL2450; Medium Notes: $t = 21.0\text{ C}$

Medium parameters used: $f = 2442\text{ MHz}$; $\sigma = 1.83\text{ mho/m}$; $\epsilon_r = 37.4$; $\rho = 1000\text{ kg/m}^3$

Phantom section: Left Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3573
- ConvF(6.56, 6.56, 6.56); Calibrated: 2009-11-20
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn793; Calibrated: 2010-09-08
- Phantom: SAM1; Type: SAM; Serial: TP-1126
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Tilt - Middle/Area Scan (51x91x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.272 mW/g

Tilt - Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=7.5\text{mm}$, $dy=7.5\text{mm}$, $dz=5\text{mm}$

Reference Value = 11.3 V/m

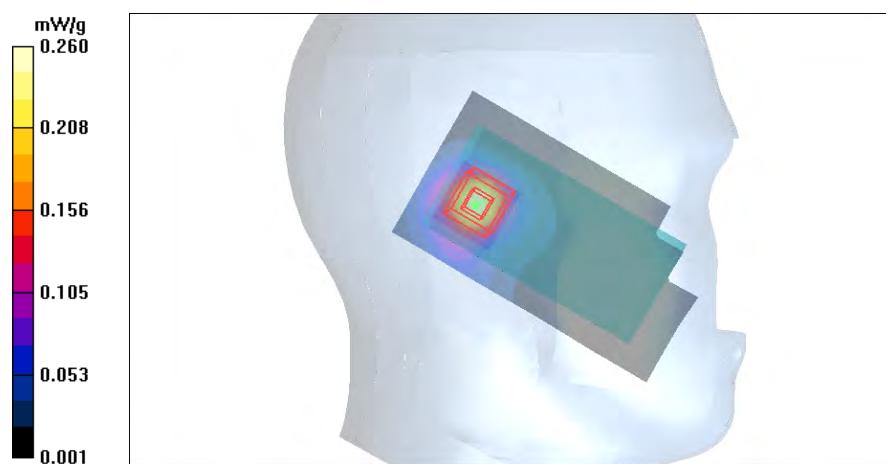
Peak SAR (extrapolated) = 0.448 W/kg

SAR(1 g) = 0.227 mW/g

SAR(10 g) = 0.111 mW/g

Power Drift = -0.053 dB

Maximum value of SAR (measured) = 0.260 mW/g



SAR Report

FCC_RM-601_09

Applicant: Nokia Corporation

Type: RM-601

Copyright © 2010 TCC Nokia

Date/Time: 2010-11-03 12:19:45

Test Laboratory: TCC Nokia

Type: RM-601; Serial: 353759/04/002344/6

Communication System: WLAN2450 b-mode

Frequency: 2442 MHz; Duty Cycle: 1:1

Medium: HSL2450; Medium Notes: $t = 21.0 \text{ }^{\circ}\text{C}$

Medium parameters used: $f = 2442 \text{ MHz}$; $\sigma = 1.83 \text{ mho/m}$; $\epsilon_r = 37.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3573
- ConvF(6.56, 6.56, 6.56); Calibrated: 2009-11-20
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn793; Calibrated: 2010-09-08
- Phantom: SAM1; Type: SAM; Serial: TP-1126
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Cheek - Middle/Area Scan (51x91x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.260 mW/g

Cheek - Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=7.5\text{mm}$, $dy=7.5\text{mm}$, $dz=5\text{mm}$

Reference Value = 9.29 V/m

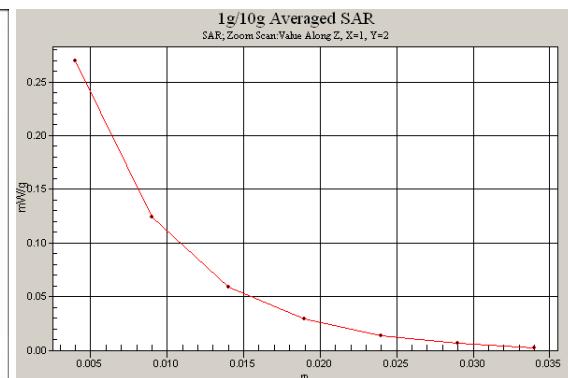
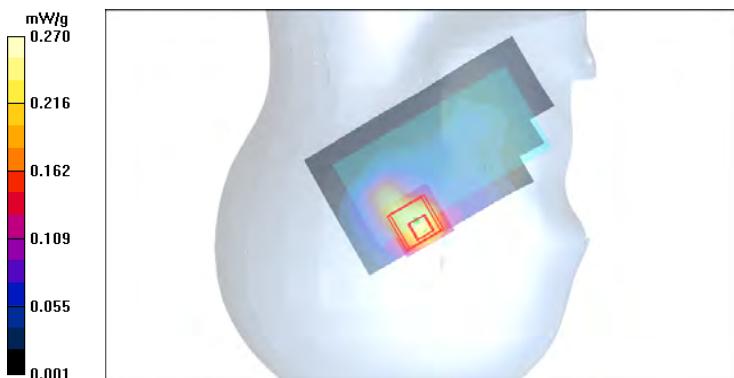
Peak SAR (extrapolated) = 0.550 W/kg

SAR(1 g) = 0.248 mW/g

SAR(10 g) = 0.125 mW/g

Power Drift = 0.120 dB

Maximum value of SAR (measured) = 0.270 mW/g



Date/Time: 2010-11-03 12:34:03

Test Laboratory: TCC Nokia

Type: RM-601; Serial: 353759/04/002344/6

Communication System: WLAN2450 b-mode

Frequency: 2442 MHz; Duty Cycle: 1:1

Medium: HSL2450; Medium Notes: $t = 21.0 \text{ }^{\circ}\text{C}$

Medium parameters used: $f = 2442 \text{ MHz}$; $\sigma = 1.83 \text{ mho/m}$; $\epsilon_r = 37.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3573
- ConvF(6.56, 6.56, 6.56); Calibrated: 2009-11-20
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn793; Calibrated: 2010-09-08
- Phantom: SAM1; Type: SAM; Serial: TP-1126
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Tilt - Middle/Area Scan (51x91x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.222 mW/g

Tilt - Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=7.5\text{mm}$, $dy=7.5\text{mm}$, $dz=5\text{mm}$

Reference Value = 11.0 V/m

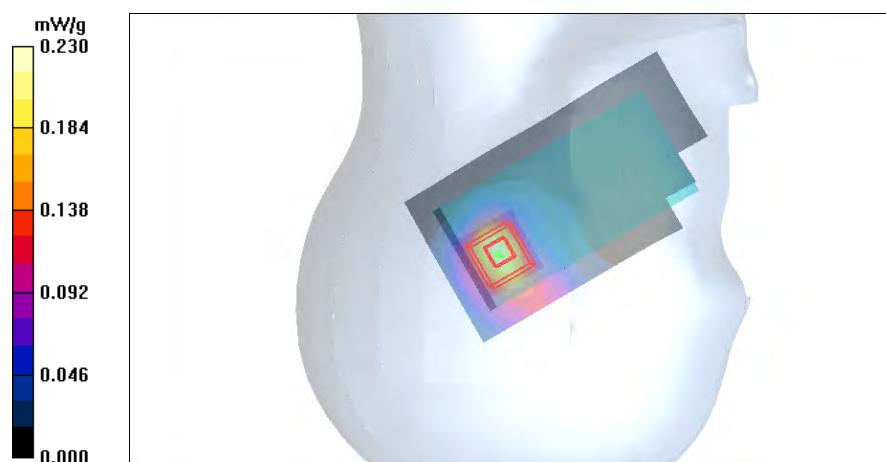
Peak SAR (extrapolated) = 0.391 W/kg

SAR(1 g) = 0.202 mW/g

SAR(10 g) = 0.101 mW/g

Power Drift = -0.055 dB

Maximum value of SAR (measured) = 0.230 mW/g



SAR Report

FCC_RM-601_09

Applicant: Nokia Corporation

Type: RM-601

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Date/Time: 2010-11-03 14:08:29

Test Laboratory: TCC Nokia

Type: RM-601; Serial: 353759/04/002344/6

Communication System: WLAN2450 n-mode

Frequency: 2442 MHz; Duty Cycle: 1:1

Medium: HSL2450; Medium Notes: $t = 21.0 \text{ C}$

Medium parameters used: $f = 2442 \text{ MHz}$; $\sigma = 1.83 \text{ mho/m}$; $\epsilon_r = 37.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3573
- ConvF(6.56, 6.56, 6.56); Calibrated: 2009-11-20
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn793; Calibrated: 2010-09-08
- Phantom: SAM1; Type: SAM; Serial: TP-1126
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Cheek - Middle /Area Scan (51x91x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.194 mW/g

Cheek - Middle /Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=7.5\text{mm}$, $dy=7.5\text{mm}$, $dz=5\text{mm}$

Reference Value = 7.77 V/m

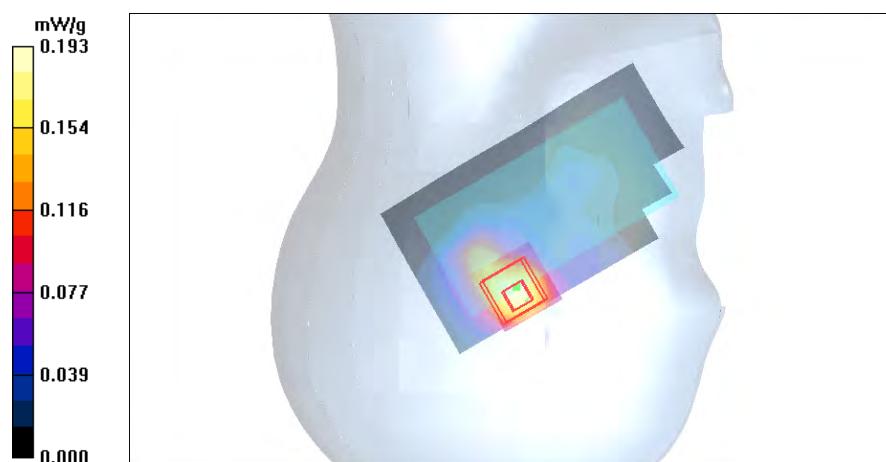
Peak SAR (extrapolated) = 0.409 W/kg

SAR(1 g) = 0.185 mW/g

SAR(10 g) = 0.093 mW/g

Power Drift = 0.194 dB

Maximum value of SAR (measured) = 0.193 mW/g



Date/Time: 2010-11-03 15:07:20

Test Laboratory: TCC Nokia

Type: RM-601; Serial: 353759/04/002344/6

Communication System: WLAN2450 b-mode

Frequency: 2442 MHz; Duty Cycle: 1:1

Medium: BSL2450; Medium Notes: $t = 21.0 \text{ C}$

Medium parameters used: $f = 2442 \text{ MHz}$; $\sigma = 2.01 \text{ mho/m}$; $\epsilon_r = 50.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3573
- ConvF(6.63, 6.63, 6.63); Calibrated: 2009-11-20
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn793; Calibrated: 2010-09-08
- Phantom: SAM2; Type: SAM; Serial: TP-1570
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Body - Middle - No accessory - Back Facing Phantom/Area Scan (51x91x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.107 mW/g

Body - Middle - No accessory - Back Facing Phantom/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=7.5\text{mm}$, $dy=7.5\text{mm}$, $dz=5\text{mm}$

Reference Value = 5.73 V/m

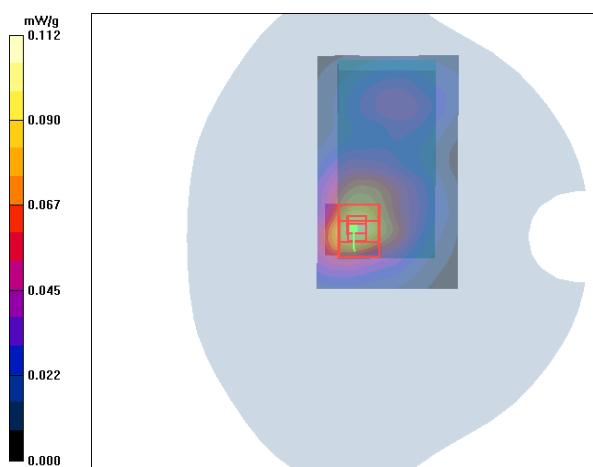
Peak SAR (extrapolated) = 0.184 W/kg

SAR(1 g) = 0.100 mW/g

SAR(10 g) = 0.054 mW/g

Power Drift = 0.078 dB

Maximum value of SAR (measured) = 0.112 mW/g



SAR Report

FCC_RM-601_09

Applicant: Nokia Corporation

Type: RM-601

Copyright © 2010 TCC Nokia

Date/Time: 2010-11-03 15:19:34

Test Laboratory: TCC Nokia

Type: RM-601; Serial: 353759/04/002344/6

Communication System: WLAN2450 b-mode

Frequency: 2442 MHz; Duty Cycle: 1:1

Medium: BSL2450; Medium Notes: $t = 21.0 \text{ C}$

Medium parameters used: $f = 2442 \text{ MHz}$; $\sigma = 2.01 \text{ mho/m}$; $\epsilon_r = 50.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3573
- ConvF(6.63, 6.63, 6.63); Calibrated: 2009-11-20
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn793; Calibrated: 2010-09-08
- Phantom: SAM2; Type: SAM; Serial: TP-1570
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Body - Middle - WH-102 - Back Facing Phantom/Area Scan (51x91x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.117 mW/g

Body - Middle - WH-102 - Back Facing Phantom/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=7.5\text{mm}$, $dy=7.5\text{mm}$, $dz=5\text{mm}$

Reference Value = 5.75 V/m

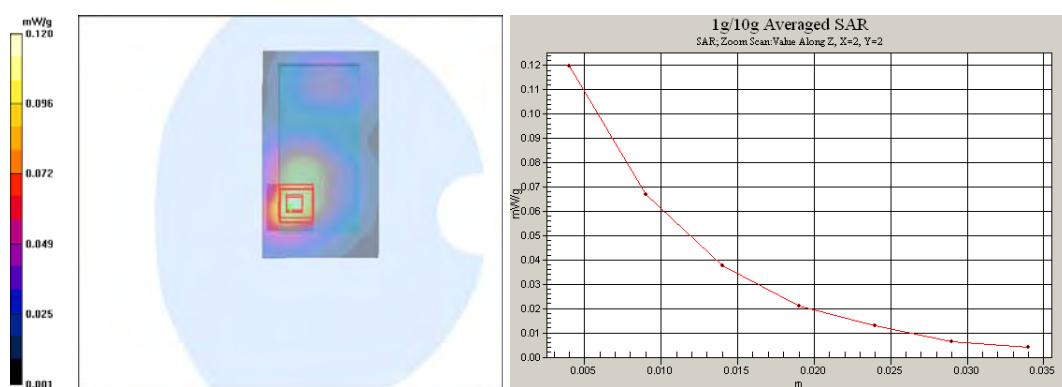
Peak SAR (extrapolated) = 0.196 W/kg

SAR(1 g) = 0.109 mW/g

SAR(10 g) = 0.060 mW/g

Power Drift = 0.113 dB

Maximum value of SAR (measured) = 0.120 mW/g



SAR Report

FCC_RM-601_09

Applicant: Nokia Corporation

Type: RM-601

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Date/Time: 2010-11-03 16:07:54

Test Laboratory: TCC Nokia

Type: RM-601; Serial: 353759/04/002344/6

Communication System: WLAN2450 n-mode

Frequency: 2442 MHz; Duty Cycle: 1:1

Medium: BSL2450; Medium Notes: $t = 21.0 \text{ C}$

Medium parameters used: $f = 2442 \text{ MHz}$; $\sigma = 2.01 \text{ mho/m}$; $\epsilon_r = 50.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3573
- ConvF(6.63, 6.63, 6.63); Calibrated: 2009-11-20
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn793; Calibrated: 2010-09-08
- Phantom: SAM2; Type: SAM; Serial: TP-1570
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Body - Middle - WH-102 - Back Facing Phantom/Area Scan (51x91x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.080 mW/g

Body - Middle - WH-102 - Back Facing Phantom/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=7.5\text{mm}$, $dy=7.5\text{mm}$, $dz=5\text{mm}$

Reference Value = 4.96 V/m

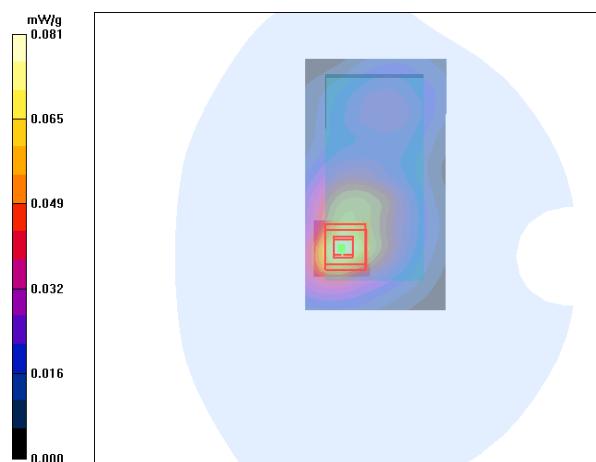
Peak SAR (extrapolated) = 0.135 W/kg

SAR(1 g) = 0.073 mW/g

SAR(10 g) = 0.040 mW/g

Power Drift = 0.287 dB

Maximum value of SAR (measured) = 0.081 mW/g



SAR Report

FCC_RM-601_09

Applicant: Nokia Corporation

Type: RM-601

Copyright © 2010 TCC Nokia

Date/Time: 2010-06-09 09:44:27, Date/Time: 2010-11-03 11:46:18

Test Laboratory: TCC Nokia

Type: RM-601; Serial: 004401/10/970863/2, Serial: 353759/04/002344/6

Communication System: 3-slot GPRS850, Communication System: WLAN2450 b-mode

Frequency: 848.8 MHz, Frequency: 2442 MHz; Duty Cycle: 1:2.8, Duty Cycle: 1:1

Medium: HSL850, Medium: HSL2450; Medium Notes: t=20.4 C, Medium Notes: t= 21.0 C

Medium parameters used: $f = 849$ MHz; $\sigma = 0.889$ mho/m; $\epsilon_r = 40.7$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 2442$ MHz; $\sigma = 1.83$ mho/m; $\epsilon_r = 37.4$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3131, Probe: EX3DV4 - SN3573
- ConvF(5.85, 5.85, 5.85), ConvF(6.56, 6.56, 6.56); Calibrated: 2009-10-27, Calibrated: 2009-11-20
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))
- Electronics: DAE4 Sn1213, Electronics: DAE4 Sn793; Calibrated: 2009-11-16, Calibrated: 2010-09-08
- Phantom: SAM 3, Phantom: SAM1; Type: Twin SAM 040 CA, Type: SAM; Serial: TP-1179, Serial: TP-1126
- ; SEMCAD X Version 14.0 Build 61

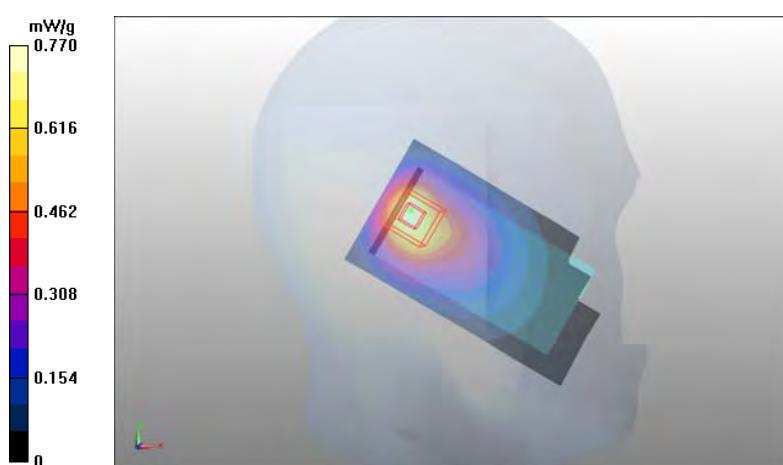
Configuration/Tilt -High/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm

Configuration/Tilt - Middle/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm

Motorola Fast SAR of Combined Scans: SAR(1 g) = 0.690 mW/g

SAR(10 g) = 0.426 mW/g

Maximum value of SAR (measured) = 0.770 mW/g



Date/Time: 2010-06-09 13:36:11, Date/Time: 2010-11-03 11:46:18

Test Laboratory: TCC Nokia

Type: RM-601; Serial: 004401/10/970863/2, Serial: 353759/04/002344/6

Communication System: WCDMA850, Communication System: WLAN2450 b-mode

Frequency: 846.6 MHz, Frequency: 2442 MHz; Duty Cycle: 1:1

Medium: HSL850, Medium: HSL2450; Medium Notes: t=20.4 C, Medium Notes: t= 21.0 C

Medium parameters used: $f = 847$ MHz; $\sigma = 0.889$ mho/m; $\epsilon_r = 40.7$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 2442$ MHz; $\sigma = 1.83$ mho/m; $\epsilon_r = 37.4$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3131, Probe: EX3DV4 - SN3573
- ConvF(5.85, 5.85, 5.85), ConvF(6.56, 6.56, 6.56); Calibrated: 2009-10-27, Calibrated: 2009-11-20
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))
- Electronics: DAE4 Sn1213, Electronics: DAE4 Sn793; Calibrated: 2009-11-16, Calibrated: 2010-09-08
- Phantom: SAM 3, Phantom: SAM1; Type: Twin SAM 040 CA, Type: SAM; Serial: TP-1179, Serial: TP-1126
- ; SEMCAD X Version 14.0 Build 61

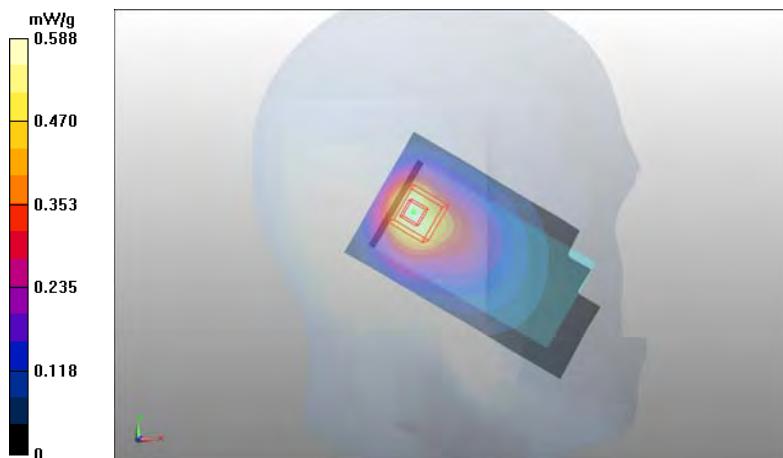
Configuration/Tilt - High/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm

Configuration/Tilt - Middle/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm

Motorola Fast SAR of Combined Scans: SAR(1 g) = 0.530 mW/g

SAR(10 g) = 0.325 mW/g

Maximum value of SAR (measured) = 0.588 mW/g



Date/Time: 2010-06-16 10:21:27, Date/Time: 2010-11-03 11:46:18

Test Laboratory: TCC Nokia

Type: RM-601; Serial: 004401/10/970863/2, Serial: 353759/04/002344/6

Communication System: WCDMA1700/2100, Communication System: WLAN2450 b-mode

Frequency: 1752.6 MHz, Frequency: 2442 MHz; Duty Cycle: 1:1

Medium: HSL1800, Medium: HSL2450; Medium Notes: t= 20.5 C, Medium Notes: t= 21.0 C

Medium parameters used: $f = 1753$ MHz; $\sigma = 1.33$ mho/m; $\epsilon_r = 39.1$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 2442$ MHz; $\sigma = 1.83$ mho/m; $\epsilon_r = 37.4$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3194, Probe: EX3DV4 - SN3573
- ConvF(5.25, 5.25, 5.25), ConvF(6.56, 6.56, 6.56); Calibrated: 2009-11-20
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))
- Electronics: DAE4 Sn728, Electronics: DAE4 Sn793; Calibrated: 2010-03-19, Calibrated: 2010-09-08
- Phantom: SAM 4, Phantom: SAM1; Type: Twin SAM 040 CA, Type: SAM; Serial: TP-1018, Serial: TP-1126
- ; SEMCAD X Version 14.0 Build 61

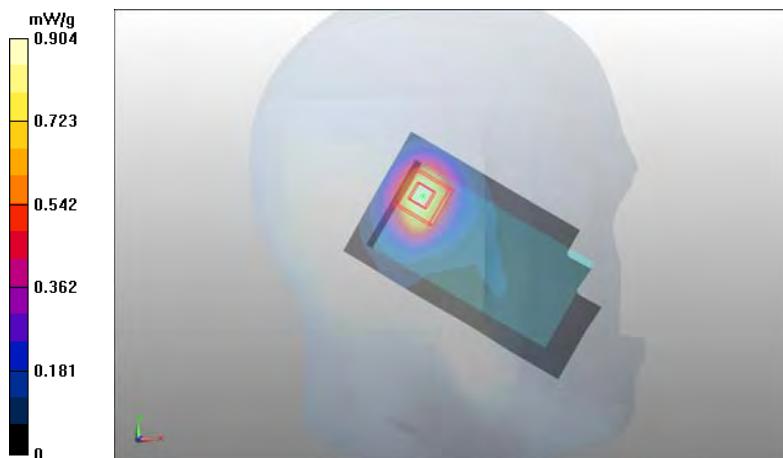
Configuration/Tilt - High/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm

Configuration/Tilt - Middle/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm

Motorola Fast SAR of Combined Scans: SAR(1 g) = 0.808 mW/g

SAR(10 g) = 0.454 mW/g

Maximum value of SAR (measured) = 0.904 mW/g



Date/Time: 2010-06-11 10:23:24, Date/Time: 2010-11-03 11:46:18

Test Laboratory: TCC Nokia

Type: RM-601; Serial: 004401/10/970863/2, Serial: 353759/04/002344/6

Communication System: 4-slot GPRS1900, Communication System: WLAN2450 b-mode

Frequency: 1909.8 MHz, Frequency: 2442 MHz; Duty Cycle: 1:2.1, Duty Cycle: 1:1

Medium: HSL1900, Medium: HSL2450; Medium Notes: t=21.1 C, Medium Notes: t= 21.0 C

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.39$ mho/m; $\epsilon_r = 39.2$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 2442$ MHz; $\sigma = 1.83$ mho/m; $\epsilon_r = 37.4$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3194, Probe: EX3DV4 - SN3573
- ConvF(5.06, 5.06, 5.06), ConvF(6.56, 6.56, 6.56); Calibrated: 2009-11-20
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))
- Electronics: DAE4 Sn728, Electronics: DAE4 Sn793; Calibrated: 2010-03-19, Calibrated: 2010-09-08
- Phantom: SAM 1, Phantom: SAM1; Type: Twin SAM 040 CA, Type: SAM; Serial: TP-1449, Serial: TP-1126
- ; SEMCAD X Version 14.0 Build 61

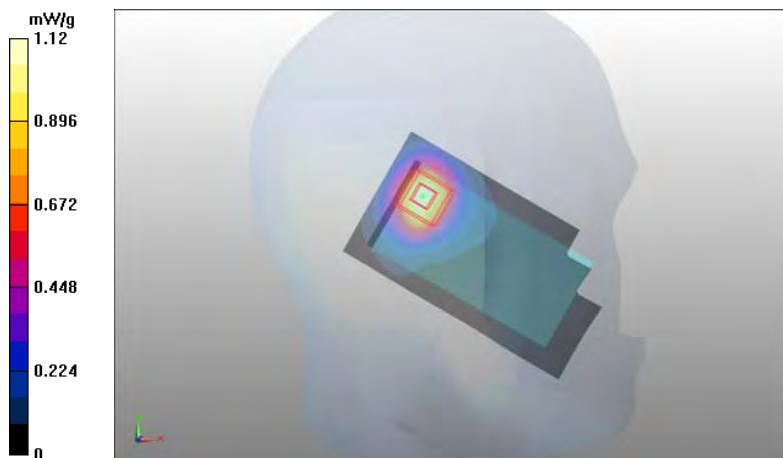
Configuration/Tilt - High/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm

Configuration/Tilt - Middle/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm

Motorola Fast SAR of Combined Scans: SAR(1 g) = 0.986 mW/g

SAR(10 g) = 0.537 mW/g

Maximum value of SAR (measured) = 1.12 mW/g



Date/Time: 2010-06-11 13:25:51, Date/Time: 2010-11-03 11:46:18

Test Laboratory: TCC Nokia

Type: RM-601; Serial: 004401/10/970863/2, Serial: 353759/04/002344/6

Communication System: WCDMA1900, Communication System: WLAN2450 b-mode

Frequency: 1852.4 MHz, Frequency: 2442 MHz; Duty Cycle: 1:1

Medium: HSL1900, Medium: HSL2450; Medium Notes: t=21.1 C, Medium Notes: t= 21.0 C

Medium parameters used (interpolated): $f = 1852.4$ MHz; $\sigma = 1.34$ mho/m; $\epsilon_r = 39.4$; $\rho = 1000$ kg/m³ , Medium parameters used: $f = 2442$ MHz; $\sigma = 1.83$ mho/m; $\epsilon_r = 37.4$; $\rho = 1000$ kg/m³

Phantom section: Left Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3194, Probe: EX3DV4 - SN3573
- ConvF(5.06, 5.06, 5.06), ConvF(6.56, 6.56, 6.56); Calibrated: 2009-11-20
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))
- Electronics: DAE4 Sn728, Electronics: DAE4 Sn793; Calibrated: 2010-03-19, Calibrated: 2010-09-08
- Phantom: SAM 1, Phantom: SAM1; Type: Twin SAM 040 CA, Type: SAM; Serial: TP-1449, Serial: TP-1126
- ; SEMCAD X Version 14.0 Build 61

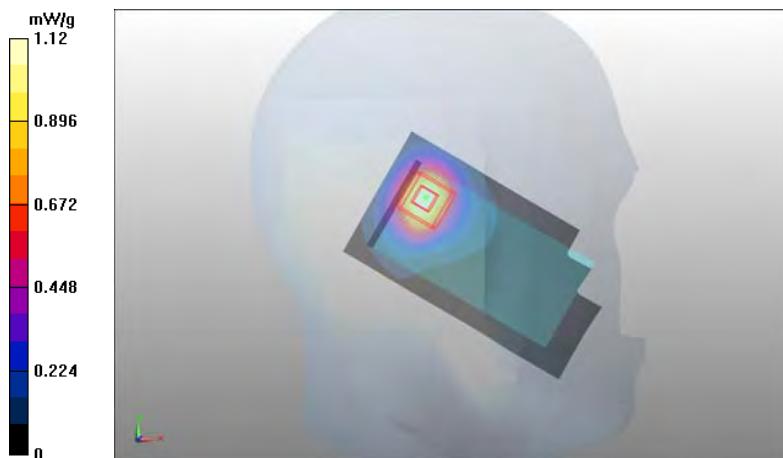
Configuration/Tilt - Low/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm

Configuration/Tilt - Middle/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm

Motorola Fast SAR of Combined Scans: SAR(1 g) = 0.994 mW/g

SAR(10 g) = 0.547 mW/g

Maximum value of SAR (measured) = 1.12 mW/g



Date/Time: 2010-06-09 17:35:22, Date/Time: 2010-11-03 15:07:20

Test Laboratory: TCC Nokia

Type: RM-601; Serial: 004401/10/970863/2, Serial: 353759/04/002344/6

Communication System: 3-slot GPRS850, Communication System: WLAN2450 b-mode

Frequency: 848.8 MHz, Frequency: 2442 MHz; Duty Cycle: 1:2.8, Duty Cycle: 1:1

Medium: BSL850, Medium: BSL2450; Medium Notes: t=20.6 C, Medium Notes: t= 21.0 C

Medium parameters used: $f = 849$ MHz; $\sigma = 1$ mho/m; $\epsilon_r = 54.1$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 2442$ MHz; $\sigma = 2.01$ mho/m; $\epsilon_r = 50.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

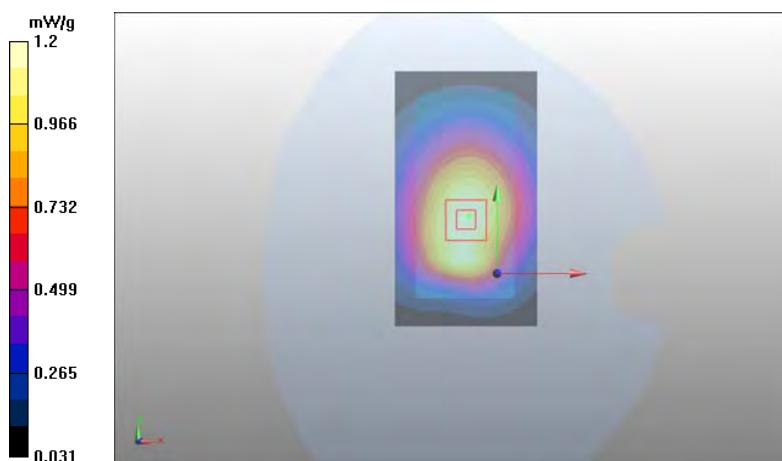
- Probe: ES3DV3 - SN3131, Probe: EX3DV4 - SN3573
- ConvF(5.69, 5.69, 5.69), ConvF(6.63, 6.63, 6.63); Calibrated: 2009-10-27, Calibrated: 2009-11-20
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1213, Electronics: DAE4 Sn793; Calibrated: 2009-11-16, Calibrated: 2010-09-08
- Phantom: SAM 1, Phantom: SAM2; Type: Twin SAM 040 CA, Type: SAM; Serial: TP-1179, Serial: TP-1570
- ; SEMCAD X Version 14.0 Build 61

Configuration/Body - High - No Accessory -Back Facing Phantom/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm

Configuration/Body - Middle - No accessory - Back Facing Phantom/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm

**Motorola Fast SAR of Combined Scans: SAR(1 g) = 1.13 mW/g
SAR(10 g) = 0.792 mW/g**

Maximum value of SAR (measured) = 1.2 mW/g



Date/Time: 2010-06-09 15:35:57, Date/Time: 2010-11-03 15:07:20

Test Laboratory: TCC Nokia

Type: RM-601; Serial: 004401/10/970863/2, Serial: 353759/04/002344/6

Communication System: WCDMA850, Communication System: WLAN2450 b-mode

Frequency: 846.6 MHz, Frequency: 2442 MHz; Duty Cycle: 1:1

Medium: BSL850, Medium: BSL2450; Medium Notes: t=20.6 C, Medium Notes: t= 21.0 C

Medium parameters used: $f = 847$ MHz; $\sigma = 1$ mho/m; $\epsilon_r = 54.2$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 2442$ MHz; $\sigma = 2.01$ mho/m; $\epsilon_r = 50.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

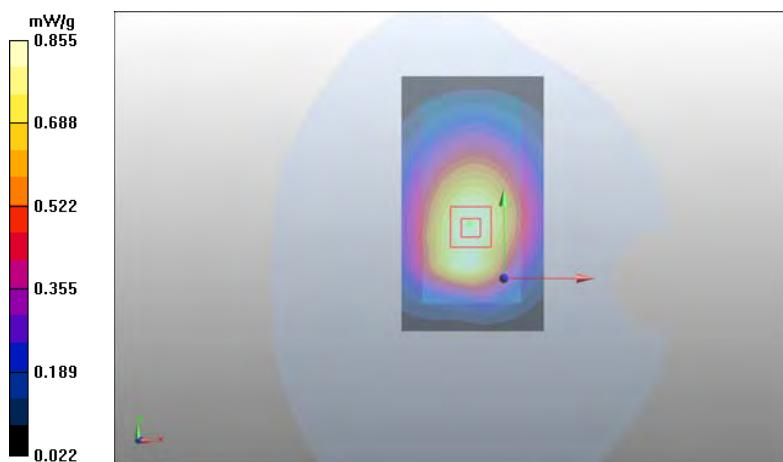
- Probe: ES3DV3 - SN3131, Probe: EX3DV4 - SN3573
- ConvF(5.69, 5.69, 5.69), ConvF(6.63, 6.63, 6.63); Calibrated: 2009-10-27, Calibrated: 2009-11-20
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1213, Electronics: DAE4 Sn793; Calibrated: 2009-11-16, Calibrated: 2010-09-08
- Phantom: SAM 1, Phantom: SAM2; Type: Twin SAM 040 CA, Type: SAM; Serial: TP-1179, Serial: TP-1570
- ; SEMCAD X Version 14.0 Build 61

Configuration/Body - High - No Accessory -Back Facing Phantom/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm

Configuration/Body - Middle - No accessory - Back Facing Phantom/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm

**Motorola Fast SAR of Combined Scans: SAR(1 g) = 0.811 mW/g
SAR(10 g) = 0.564 mW/g**

Maximum value of SAR (measured) = 0.855 mW/g



Date/Time: 2010-06-16 12:26:47, Date/Time: 2010-11-03 15:07:20

Test Laboratory: TCC Nokia

Type: RM-601; Serial: 004401/10/970863/2, Serial: 353759/04/002344/6

Communication System: WCDMA1700/2100, Communication System: WLAN2450 b-mode

Frequency: 1752.6 MHz, Frequency: 2442 MHz; Duty Cycle: 1:1

Medium: BSL1800, Medium: BSL2450; Medium Notes: t=20.3 C, Medium Notes: t= 21.0 C

Medium parameters used: $f = 1753$ MHz; $\sigma = 1.45$ mho/m; $\epsilon_r = 51.3$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 2442$ MHz; $\sigma = 2.01$ mho/m; $\epsilon_r = 50.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

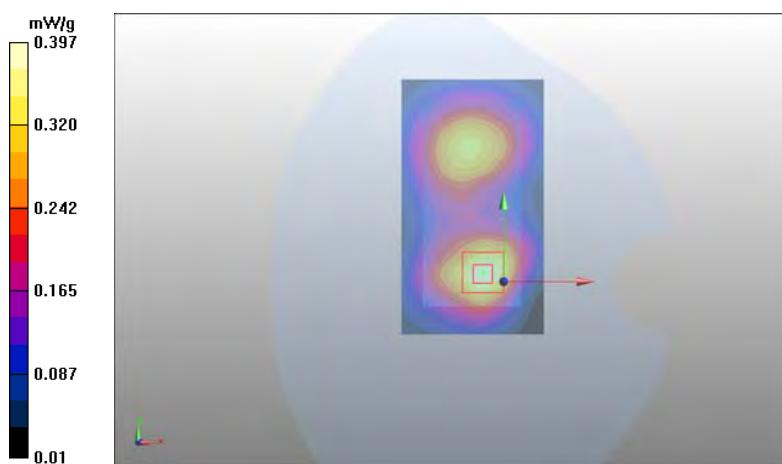
- Probe: ES3DV3 - SN3194, Probe: EX3DV4 - SN3573
- ConvF(4.92, 4.92, 4.92), ConvF(6.63, 6.63, 6.63); Calibrated: 2009-11-20
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn728, Electronics: DAE4 Sn793; Calibrated: 2010-03-19, Calibrated: 2010-09-08
- Phantom: SAM 3, Phantom: SAM2; Type: Twin SAM 040 CA, Type: SAM; Serial: TP-1179, Serial: TP-1570
- ; SEMCAD X Version 14.0 Build 61

Configuration/Body - High - No accessory - Back Facing Phantom/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm

Configuration/Body - Middle - No accessory - Back Facing Phantom/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm

**Motorola Fast SAR of Combined Scans: SAR(1 g) = 0.360 mW/g
SAR(10 g) = 0.210 mW/g**

Maximum value of SAR (measured) = 0.397 mW/g



Date/Time: 2010-06-12 16:14:24, Date/Time: 2010-11-03 15:19:34

Test Laboratory: TCC Nokia

Type: RM-601; Serial: 004401/10/970863/2, Serial: 353759/04/002344/6

Communication System: 4-slot GPRS1900, Communication System: WLAN2450 b-mode

Frequency: 1880 MHz, Frequency: 2442 MHz; Duty Cycle: 1:2.1, Duty Cycle: 1:1

Medium: BSL1900, Medium: BSL2450; Medium Notes: t=20.8 C, Medium Notes: t= 21.0 C

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.49$ mho/m; $\epsilon_r = 53$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 2442$ MHz; $\sigma = 2.01$ mho/m; $\epsilon_r = 50.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

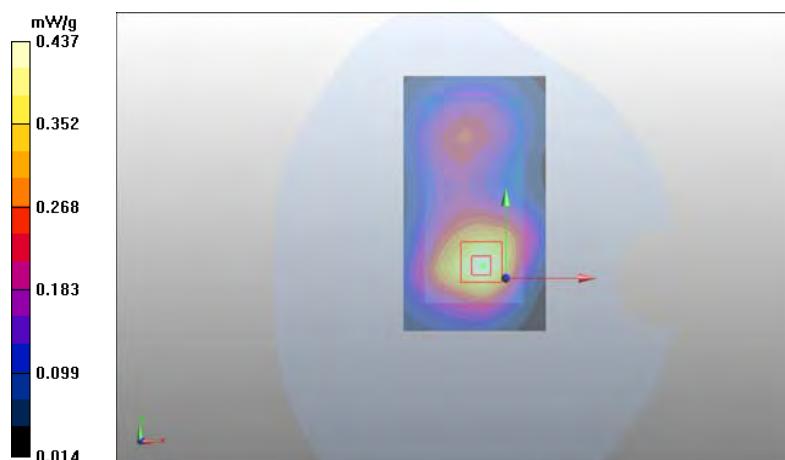
- Probe: ES3DV3 - SN3194, Probe: EX3DV4 - SN3573
- ConvF(4.67, 4.67, 4.67), ConvF(6.63, 6.63, 6.63); Calibrated: 2009-11-20
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn728, Electronics: DAE4 Sn793; Calibrated: 2010-03-19, Calibrated: 2010-09-08
- Phantom: SAM 2, Phantom: SAM2; Type: Twin SAM 040 CA, Type: SAM; Serial: TP - 1177, Serial: TP-1570
- ; SEMCAD X Version 14.0 Build 61

Configuration/Body - Middle - WH-102 - Back Facing Phantom/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm

Motorola Fast SAR of Combined Scans: SAR(1 g) = 0.398 mW/g

SAR(10 g) = 0.233 mW/g

Maximum value of SAR (measured) = 0.437 mW/g



Date/Time: 2010-06-12 15:32:55, Date/Time: 2010-11-03 15:19:34

Test Laboratory: TCC Nokia

Type: RM-601; Serial: 004401/10/970863/2, Serial: 353759/04/002344/6

Communication System: WCDMA1900, Communication System: WLAN2450 b-mode

Frequency: 1852.4 MHz, Frequency: 2442 MHz; Duty Cycle: 1:1

Medium: BSL1900, Medium: BSL2450; Medium Notes: t=20.8 C, Medium Notes: t= 21.0 C

Medium parameters used (interpolated): f = 1852.4 MHz; $\sigma = 1.46 \text{ mho/m}$; $\epsilon_r = 53$; $\rho = 1000 \text{ kg/m}^3$, Medium parameters used: f = 2442 MHz; $\sigma = 2.01 \text{ mho/m}$; $\epsilon_r = 50.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

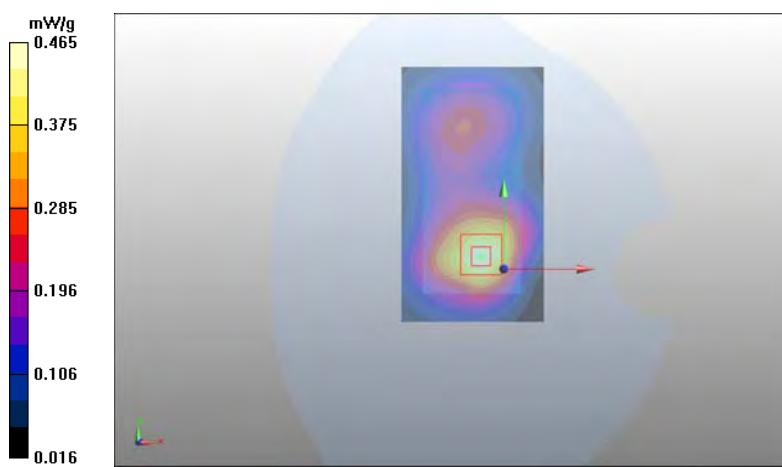
- Probe: ES3DV3 - SN3194, Probe: EX3DV4 - SN3573
- ConvF(4.67, 4.67, 4.67), ConvF(6.63, 6.63, 6.63); Calibrated: 2009-11-20
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn728, Electronics: DAE4 Sn793; Calibrated: 2010-03-19, Calibrated: 2010-09-08
- Phantom: SAM 2, Phantom: SAM2; Type: Twin SAM 040 CA, Type: SAM; Serial: TP - 1177, Serial: TP-1570
- ; SEMCAD X Version 14.0 Build 61

Configuration/Body - Low - WH-102 - Back Facing Phantom/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm

Configuration/Body - Middle - WH-102 - Back Facing Phantom/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm

**Motorola Fast SAR of Combined Scans: SAR(1 g) = 0.422 mW/g
SAR(10 g) = 0.247 mW/g**

Maximum value of SAR (measured) = 0.465 mW/g



APPENDIX C: RELEVANT PAGES FROM PROBE CALIBRATION REPORTS



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

The Swiss Accreditation Service is one of the signatories to the EA
 Multilateral Agreement for the recognition of calibration certificates

Client

Nokia Salo TCC

Certificate No: **EX3-3573_Nov09**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3573**

Calibration procedure(s) **QA CAL-01 v6, QA CAL-23.v3 and QA CAL-25.v2
 Calibration procedure for dosimetric E-field probes**

Calibration date: **November 20, 2009**

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 $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01026)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Reference 30 dB Attenuator	SN: S5129 (30b)	31-Mar-09 (No. 217-01027)	Mar-10
Reference Probe ES3DV2	SN: 3013	2-Jan-09 (No. ES3-3013_Jan09)	Jan-10
DAE4	SN: 660	29-Sep-09 (No. DAE4-660_Sep09)	Sep-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-09)	In house check: Oct10

Calibrated by:	Name	Function	Signature
	Marcel Fehr	Laboratory Technician	

Approved by:	Name	Function	Signature
	Katja Pokovic	Technical Manager	

Issued: November 23, 2009

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

DASY - Parameters of Probe: EX3DV4 SN:3573

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.47	0.43	0.54	$\pm 10.1\%$
DCP (mV) ^B	92.9	93.4	92.6	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc ^E (k=2)
10000	CW	0.00	X Y Z	0.00 0.00 0.00	0.00 0.00 0.00	1.00 1.00 1.00	300 300 300	$\pm 1.5\%$

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 The uncertainties of NormX,Y,Z do not affect the E^2 -field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter: uncertainty not required.

^E Uncertainty is determined using the maximum deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY - Parameters of Probe: EX3DV4 SN:3573

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]	Validity [MHz] ^c	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
835	± 50 / ± 100	41.5 ± 5%	0.90 ± 5%	8.56	8.56	8.56	0.58	0.68 ± 11.0%
1750	± 50 / ± 100	40.1 ± 5%	1.37 ± 5%	7.41	7.41	7.41	0.69	0.63 ± 11.0%
1900	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	7.16	7.16	7.16	0.60	0.68 ± 11.0%
2450	± 50 / ± 100	39.2 ± 5%	1.80 ± 5%	6.56	6.56	6.56	0.37	0.84 ± 11.0%

^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

DASY - Parameters of Probe: EX3DV4 SN:3573

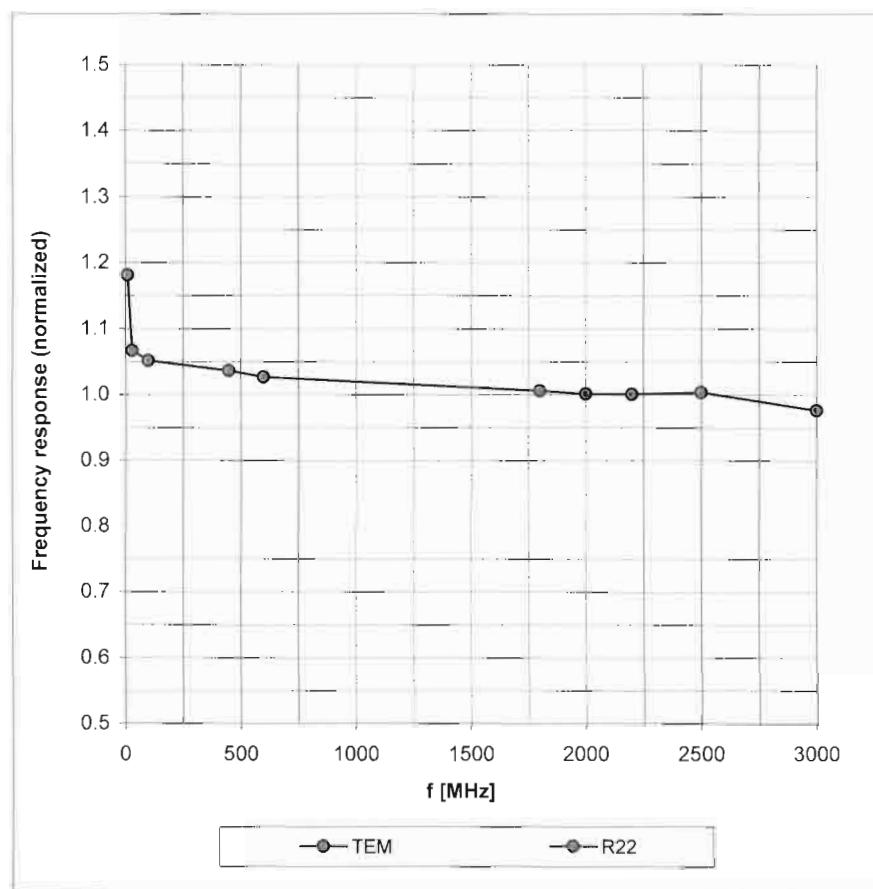
Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz] ^c	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
835	± 50 / ± 100	55.2 ± 5%	0.97 ± 5%	8.42	8.42	8.42	0.70	0.71 ± 11.0%
1750	± 50 / ± 100	53.4 ± 5%	1.49 ± 5%	7.20	7.20	7.20	0.75	0.64 ± 11.0%
1900	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	6.83	6.83	6.83	0.61	0.63 ± 11.0%
2450	± 50 / ± 100	52.7 ± 5%	1.95 ± 5%	6.63	6.63	6.63	0.40	0.85 ± 11.0%

^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

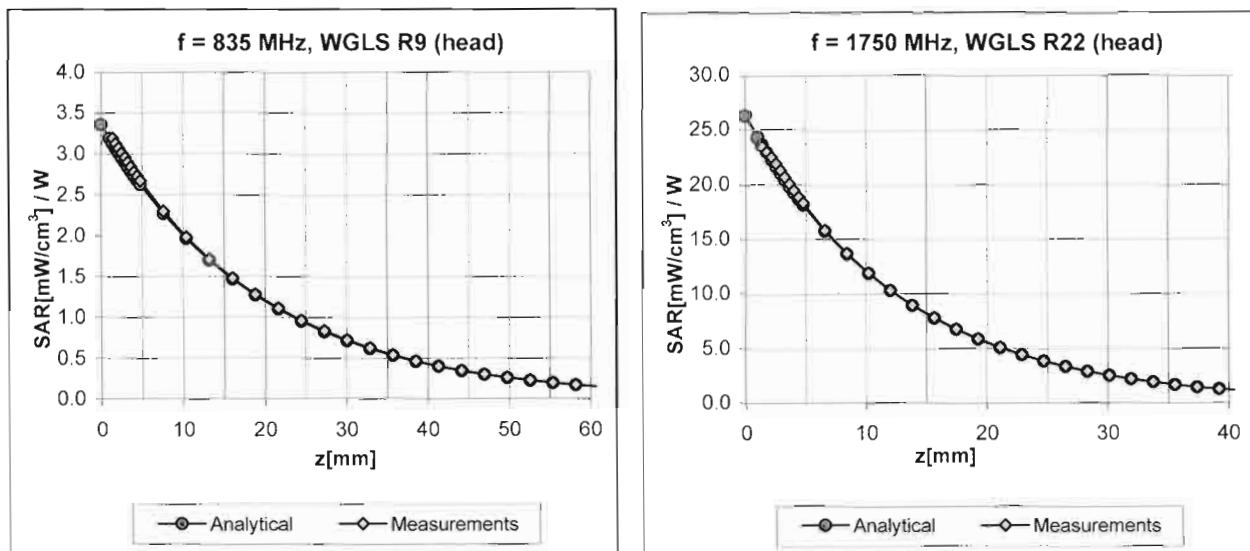
Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)



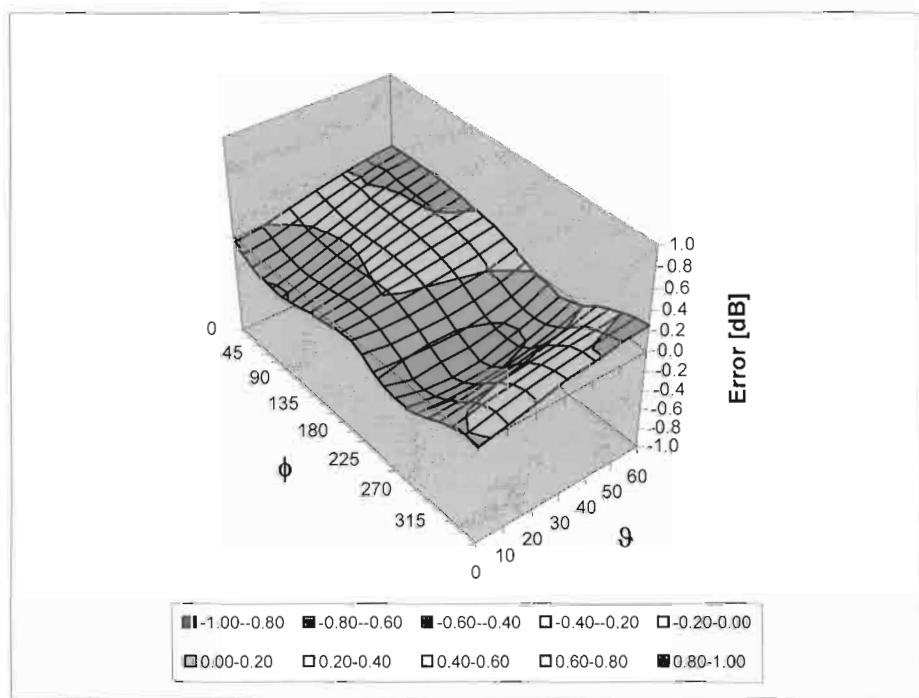
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

Conversion Factor Assessment



Deviation from Isotropy in HSL

Error (ϕ, θ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ (k=2)

APPENDIX D: RELEVANT PAGES FROM DIPOLE VALIDATION KIT REPORTS



Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Nokia Salo TCC**

Certificate No: **D2450V2-749_Oct09**

CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 749**

Calibration procedure(s) **QA CAL-05.v7**
 Calibration procedure for dipole validation kits

Calibration date: **October 21, 2009**

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 $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-09 (No. 217-01086)	Oct-10
Power sensor HP 8481A	US37292783	06-Oct-09 (No. 217-01086)	Oct-10
Reference 20 dB Attenuator	SN: 5086 (20g)	31-Mar-09 (No. 217-01025)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ES3DV3	SN: 3205	26-Jun-09 (No. ES3-3205_Jun09)	Jun-10
DAE4	SN: 601	07-Mar-09 (No. DAE4-601_Mar09)	Mar-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-09)	In house check: Oct-10

Calibrated by: **Jeton Kastrati** **Laboratory Technician**

Signature

Approved by: **Katja Pokovic** **Technical Manager**

Issued: October 22, 2009

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

DASY5 Validation Report for Head TSL

Date/Time: 21.10.2009 11:01:04

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:749

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

Medium: HSL U11 BB

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.78$ mho/m; $\epsilon_r = 39.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

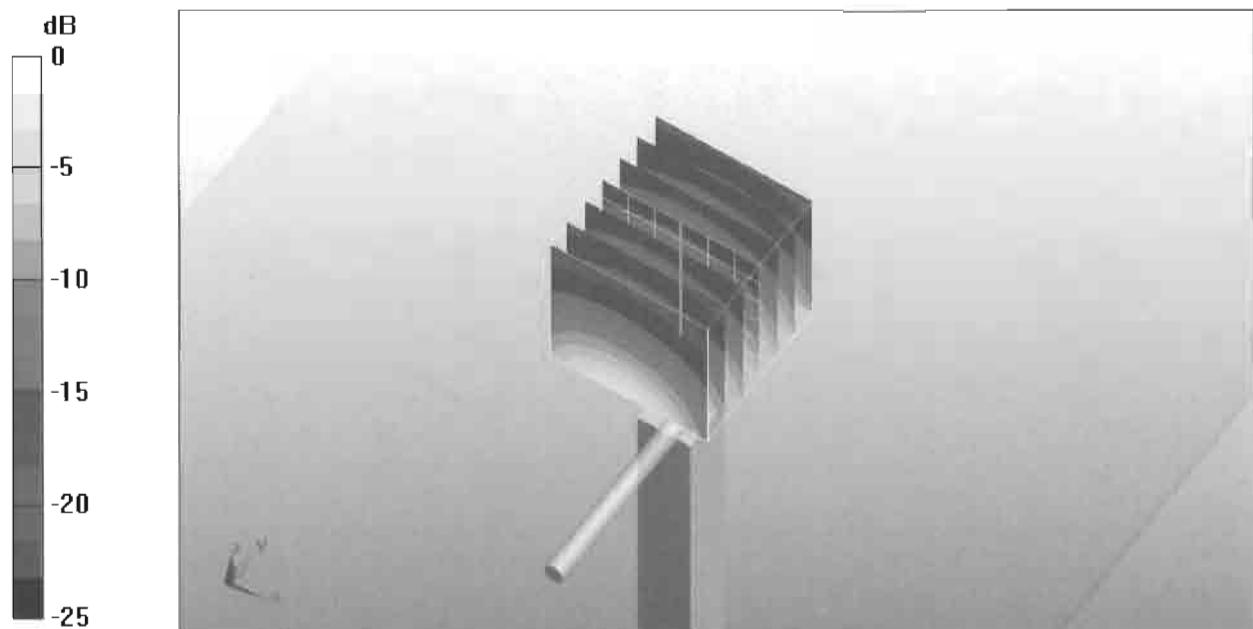
Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 100.7 V/m; Power Drift = 0.078 dB

Peak SAR (extrapolated) = 26.8 W/kg

SAR(1 g) = 13.2 mW/g; SAR(10 g) = 6.18 mW/g

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



0 dB = 16.9mW/g

DASY5 Validation Report for Body

Date/Time: 21.10.2009 12:07:58

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:749

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

Medium: MSL U10 BB

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.98$ mho/m; $\epsilon_r = 52.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.31, 4.31, 4.31); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

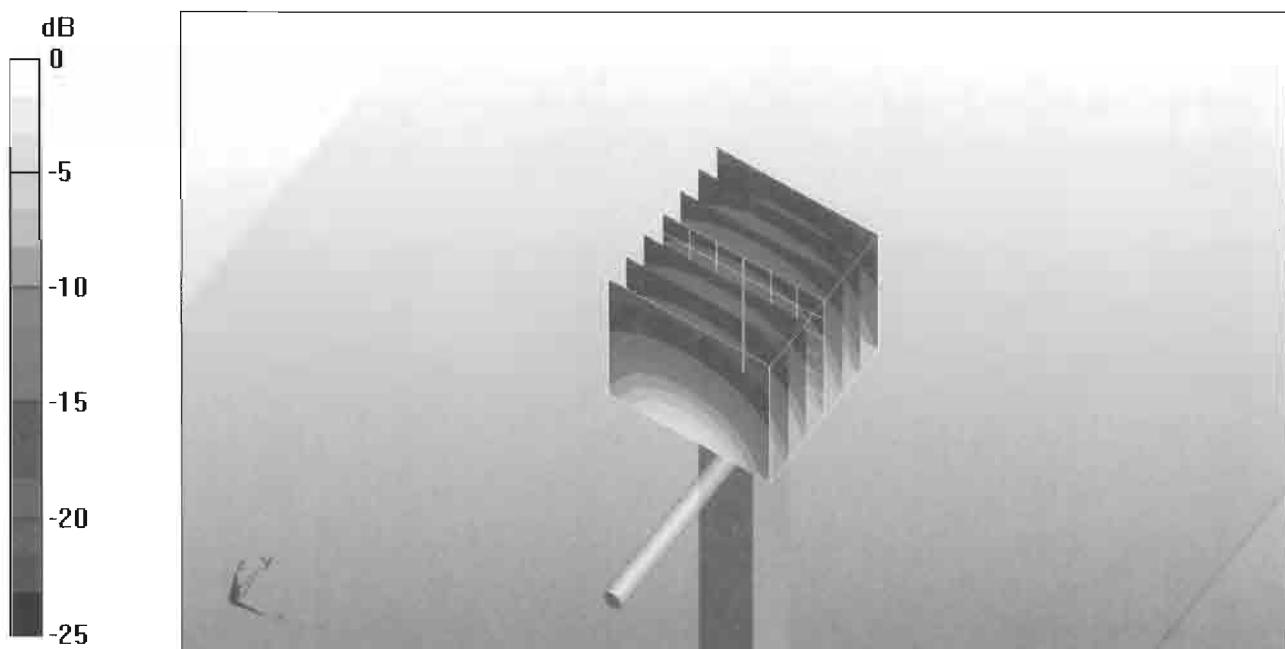
Pin250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.9 V/m; Power Drift = 0.046 dB

Peak SAR (extrapolated) = 25.8 W/kg

SAR(1 g) = 12.5 mW/g; SAR(10 g) = 5.81 mW/g

Maximum value of SAR (measured) = 16.4 mW/g



0 dB = 16.4mW/g