TCC
Salo

T117 (EN ISO/IEC 17025)

SAR Compliance Test Report

Test report no.:	Salo_SAR0418_03	**Date of report:**	2004-05-10
Template version:	2	**Number of pages:**	61
Testing laboratory:	TCC Salo, P.O. Box 86 Joensuunkatu 7E FIN-24101 SALO, FINLAND Tel. +358 (0) 7180 08000 Fax. +358 (0) 7180 45220	**Client:**	Nokia Corporation P.O. Box 12 Mattilanniemi 6 FIN-40101 Jyväskylä, FINLAND Tel. +358 (0) 7180 080112200 Fax. +358 (0) 7180 78000
Responsible test engineer:	Virpi Tuominen	**Product contact person:**	Mikael Honkanen
Measurements made by:	Virpi Tuominen		
Tested device:	NHL-12		
FCC ID:	QURNHL-12X	**IC:**	661AC-NHL12
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 Salo.

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: **2004-05-10**

For the contents:

Virpi Tuominen
Senior Design Engineer

CONTENTS

1. SUMMARY OF SAR TEST REPORT

1.1 Test Details

Period of test	2004-04-27 to 2004-04-29
SN, HW and SW numbers of tested device	SN: 004400/37/172947/4, HW: 1401, SW: 2.01.4, DUT: 07086
Batteries used in testing	BL-5C, DUT #'s: 06673, 06674, 07087
Headsets used in testing	HDS-3, SN: HJ32863491, DUT: 06909
Other accessories used in testing	MMC-card, SN: HB28D032MM2, DUT: 07088
State of sample	Prototype unit
Notes	-

1.2 Maximum Results

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

1.2.1 Head Configuration

Mode	Ch / *f* (MHz)	ERP EIRP	Position	SAR limit (1g avg)	Measured SAR value (1g avg)	Result
GSM 850	251 / 849	30.67 dBm	Left Cheek	1.6 W/kg	1.16 W/kg	PASSED
GSM 1900	512 / 1850	29.25 dBm	Right Tilt	1.6 W/kg	0.58 W/kg	PASSED

1.2.2 Body Worn Configuration

Mode	Ch / *f* (MHz)	ERP EIRP	Separation distance	SAR limit (1g avg)	Measured SAR value (1g avg)	Result
GSM 850	128 / 824	29.40 dBm	2.2 cm	1.6 W/kg	0.70 W/kg	PASSED
GPRS 1900 (2-slot TX)	512 / 1850	29.15 dBm	2.2 cm	1.6 W/kg	0.74 W/kg	PASSED

1.2.3 Maximum Drift

Maximum drift during measurements	-0.14 dB

1.2.4 Measurement Uncertainty

Extended Uncertainty (k=2) 95%	± 29.1 %

2. DESCRIPTION OF THE DEVICE UNDER TEST

Device category	Portable						
Exposure environment	General population/uncontrolled						
Modes and Bands of Operation	GSM 850	GSM 1900	GPRS (GSM 850)	GPRS (GSM 1900)	EGPRS (EDGE)	EGPRS (EDGE)	BT
Modulation Mode	GMSK	GMSK	GMSK	GMSK	8PSK	8PSK	GFSK
Duty Cycle	1/8	1/8	1/8 or 2/8	1/8 or 2/8	1/8	1/8	
Transmitter Frequency Range (MHz)	824.2 – 848.8	1850.2 - 1909.8	824.2 – 848.8	1850.2 - 1909.8	824.2 – 848.8	1850.2 - 1909.8	2400.0 – 2483.5

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

2.1 Picture of the Device

2.2 Description of the Antenna

The device has an internal antenna.

3. TEST CONDITIONS

3.1 Temperature and Humidity

Period of measurement:	2004-04-27 to 2004-04-29
Ambient temperature (°C):	21.0 to 22.0
Ambient humidity (RH %):	35 to 37

3.2 Test Signal, Frequencies, and Output Power

The device was put into operation by using a call tester. Communication between the device and the call tester was 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 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 device was the 'worst-case extrapolation' algorithm.

The following table lists calibration dates of SPEAG components:

Test Equipment	Serial Number	Calibration interval	Calibration expiry
DASY3 DAE V1	372	12 months	08/2004
E-field Probe ET3DV6	1396	12 months	01/2005
Dipole Validation Kit, D835V2	462	24 months	07/2004
Dipole Validation Kit, D1900V2	5d013	24 months	07/2004

Additional test equipment used in testing:

Test Equipment	Model	Serial Number	Calibration interval	Calibration expiry
Signal Generator	SML03	101265	12 months	06/2004
Amplifier	ZHL-42 (SMA)	N072095-5	-	-
Power Meter	NRVS	849305/028	12 months	07/2004
Power Sensor	NRV-Z32	839176/020	12 months	07/2004
Call Tester	HP8922G+83220E	3114A00146+3524 U01530	12 months	12/2004
Call Tester	CMU 200	101111	12 months	07/2004
Call Tester	CMU 200	835734/049	12 months	04/2004
Vector Network Analyzer	8753E	US38432928	12 months	10/2004
Dielectric Probe Kit	85070B	US33020420	-	-

4.1.1 Isotropic E-field Probe 1396

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection system Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., butyl diglycol)
Calibration	Calibration certificate in Appendix C
Frequency	10 MHz to 3 GHz (dosimetry); Linearity: ± 0.2 dB (30 MHz to 3 GHz)
Optical Surface Detection	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.4 dB in HSL (rotation normal to probe axis)
Dynamic Range	5 µW/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 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 ± 5% of the recommended values. All tests were carried out within 24 hours of measuring the dielectric parameters.

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:

800MHz band

Ingredient	Head (% by weight)	Body (% by weight)
Deionised Water	39.74	50.75
HEC	0.25	-
Sugar	58.31	48.21
Preservative	0.15	0.10
Salt	1.55	0.94

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

4.3.2 Verification of the System

The manufacturer calibrates the probes annually. Dielectric parameters of the simulating liquids were measured every day using the dielectric probe kit and the network analyser. A SAR measurement was made following the determination of the dielectric parameters of the liquids, 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 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]	
835	Reference result	2.45	42.5	0.90	N/A
	± 10% window	2.21 – 2.70			
	2004-04-28	2.66	41.1	0.91	21.6
1900	Reference result	11.0	39.8	1.46	N/A
	± 10% window	9.90 – 12.1			
	2004-04-27	11.5	38.0	1.45	21.3

System verification, body tissue simulant

f [MHz]	Description	SAR [W/kg], 1g	Dielectric Parameters		Temp [°C]
			ε_r	σ [S/m]	
835	Reference result	2.48	55.5	0.96	N/A
	± 10% window	2.23 – 2.73			
	2004-04-29	2.48	54.3	0.95	21.5
1900	Reference result	10.6	51.0	1.57	N/A
	± 10% window	9.54 – 11.7			
	2004-04-29	10.1	50.5	1.60	21.3

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]	
836	Recommended value	41.5	0.90	N/A
	± 5% window	39.4 – 43.6	0.86 – 0.95	
	2004-04-28	41.1	0.91	21.0
1880	Recommended value	40.0	1.40	N/A
	± 5% window	38.0 – 42.0	1.33 – 1.47	
	2004-04-27	38.1	1.44	21.0

Body tissue simulant measurements

f [MHz]	Description	Dielectric Parameters		Temp [°C]
		ε_r	σ [S/m]	
836	Recommended value	55.2	0.97	N/A
	± 5% window	52.4 – 58.0	0.92 – 1.02	
	2004-04-29	54.3	0.95	21.0
1880	Recommended value	53.3	1.52	N/A
	± 5% window	50.6 – 56.0	1.44 – 1.60	
	2004-04-29	50.6	1.58	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”.

Photo of the device in “cheek” position.

Photo of the device in “tilt” position

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 the photo belowcm 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 gave higher results.

Photo of the device positioned for Body SAR measurement.
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 points covering a volume of 30x30x30 mm 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	$c_i . u_i$ (%)	v_i
Measurement System							
Probe Calibration	E2.1	±4.8	N	1	1	±4.8	∞
Axial Isotropy	E2.2	±4.7	R	√3	$(1-c_p)^{1/2}$	±1.9	∞
Hemispherical Isotropy	E2.2	±9.6	R	√3	$(c_p)^{1/2}$	±3.9	∞
Boundary Effect	E2.3	±8.3	R	√3	1	±4.8	∞
Linearity	E2.4	±4.7	R	√3	1	±2.7	∞
System Detection Limits	E2.5	±1.0	R	√3	1	±0.6	∞
Readout Electronics	E2.6	±1.0	N	1	1	±1.0	∞
Response Time	E2.7	±0.8	R	√3	1	±0.5	∞
Integration Time	E2.8	±2.6	R	√3	1	±1.5	∞
RF Ambient Conditions - Noise	E6.1	±3.0	R	√3	1	±1.7	∞
RF Ambient Conditions - Reflections	E6.1	±3.0	R	√3	1	±1.7	∞
Probe Positioner Mechanical Tolerance	E6.2	±0.4	R	√3	1	±0.2	∞
Probe Positioning with respect to Phantom Shell	E6.3	±2.9	R	√3	1	±1.7	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	E5.2	±3.9	R	√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	√3	1	±5.8	∞
Phantom and Tissue Parameters							
Phantom Uncertainty (shape and thickness tolerances)	E3.1	±4.0	R	√3	1	±2.3	∞
Liquid Conductivity Target - tolerance	E3.2	±5.0	R	√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	√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:

GSM850, Head SAR results

MMC-card option etc.	Position		SAR, averaged over 1g (W/kg)		
			Ch 128 824 MHz	Ch 190 836 MHz	Ch 251 849 MHz
no MMC	Power level		29.4 dBm	30.8 dBm	30.7 dBm
	Left	Cheek	0.750	1.07	**1.11**
		Tilt	-	0.738	-
	Right	Cheek	0.725	1.06	1.10
		Tilt	0.529	0.802	0.792
with MMC	Left Cheek		0.767	1.11	**1.13**
	Right Cheek		0.745	1.09	1.09
with MMC	Left Cheek, BT active		-	-	**1.16**

GSM1900, Head SAR results

MMC-card option etc.	Position		SAR, averaged over 1g (W/kg)		
			Ch 512 1850 MHz	Ch 661 1880 MHz	Ch 810 1910 MHz
no MMC	Power level		28.6 dBm	27.8 dBm	26.5 dBm
	Left	Cheek	-	0.376	-
		Tilt	-	0.527	-
	Right	Cheek	-	0.500	-
		Tilt	0.510	**0.582**	0.432
with MMC	Right Tilt		0.497	0.575	0.433
no MMC	Right Tilt , BT active		-	**0.583**	-

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

GSM 850, Body SAR results

Mode and band	MMC-card option	Body-worn location setup	SAR, averaged over 1g (W/kg)		
			Ch 128 824 MHz	Ch 190 836 MHz	Ch 251 849 MHz
GSM (1-slot TX)	no MMC	**Power level**	**29.4 dBm**	**30.8 dBm**	**30.7 dBm**
		no headset	**0.703**	0.682	0.543
		headset HDS-3	0.381	0.419	0.389
	with MMC	no headset	0.700	0.691	0.541
	no MMC	no headset, BT active	0.669	-	-

GPRS 850, Body SAR results

Mode and band	MMC-card option	Body-worn location setup	SAR, averaged over 1g (W/kg)		
			Ch 128 824 MHz	Ch 190 836 MHz	Ch 251 849 MHz
GPRS (2-slot TX)	no MMC	**Power level**	**25.9 dBm**	**27.2 dBm**	**27.0 dBm**
		No headset	0.517	0.514	0.451

E-GPRS 850, Body SAR results

Mode and band	MMC-card option	Body-worn location setup	SAR, averaged over 1g (W/kg)		
			Ch 128 824 MHz	Ch 190 836 MHz	Ch 251 849 MHz
E-GPRS (1-slot TX)	no MMC	**Power level**	**26.5 dBm**	**27.9 dBm**	**27.8 dBm**
		No headset	-	0.149	-

GPRS 1900, Body SAR results

Mode and band	MMC-card option	Body-worn location setup	SAR, averaged over 1g (W/kg)		
			Ch 512 1850 MHz	Ch 661 1880 MHz	Ch 810 1910 MHz
GPRS (2-slot TX)	no MMC	**Power level**	**28.6 dBm**	**27.8 dBm**	**26.5 dBm**
		no headset	**0.735**	0.703	0.583
		headset HDS-3	0.717	0.708	0.622
	with MMC	no headset	**0.739**	0.679	0.527
	with MMC	no headset, BT active	0.706	-	-

GSM 1900, Body SAR results

Mode and band	MMC-card option	Body-worn location setup	SAR, averaged over 1g (W/kg)		
			Ch 512 1850 MHz	Ch 661 1880 MHz	Ch 810 1910 MHz
GSM (1-slot TX)	no MMC	**Power level**	**28.6 dBm**	**27.8 dBm**	**26.5 dBm**
		no headset	-	0.375	-

E-GPRS 1900, Body SAR results

Mode and band	MMC-card option	Body-worn location setup	SAR, averaged over 1g (W/kg)		
			Ch 512 1850 MHz	Ch 661 1880 MHz	Ch 810 1910 MHz
E-GPRS (1-slot TX)	no MMC	**Power level**	**25.7 dBm**	**24.9 dBm**	**23.6 dBm**
		No headset	-	0.0959	-

Plots of the Measurement scans are given in Appendix B.

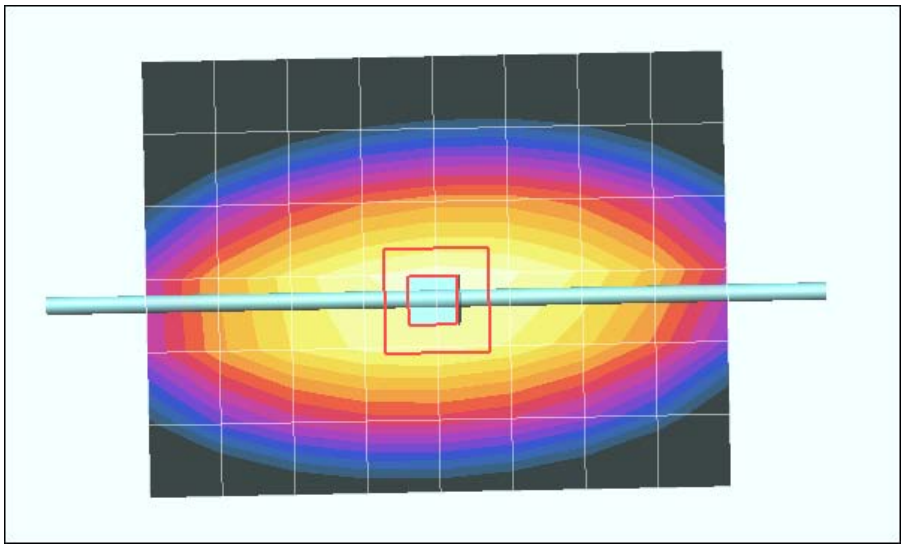
APPENDIX A: VALIDATION SCANS

Date: 2004-04-28
Test Laboratory: TCC Salo

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 462
System Performance Check at 835 MHz
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: Head, f = 835 MHz; σ = 0.906 mho/m; ε_r = 41.1; ρ = 1000 kg/m^3 , t(liq.)=21.6°C
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(6.98, 6.98, 6.98); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 2; Type: Twin SAM 040 CA; Serial: TP - 1177
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

d=15mm, Pin=250mW/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
d=15mm, Pin=250mW/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 56 V/m; Power Drift = 0.0 dB
Maximum value of SAR (measured) = 2.84 mW/g, Peak SAR (extrapolated) = 4.57 W/kg
SAR(1 g) = 2.66 mW/g; SAR(10 g) = 1.68 mW/g; Worst case extrapolation

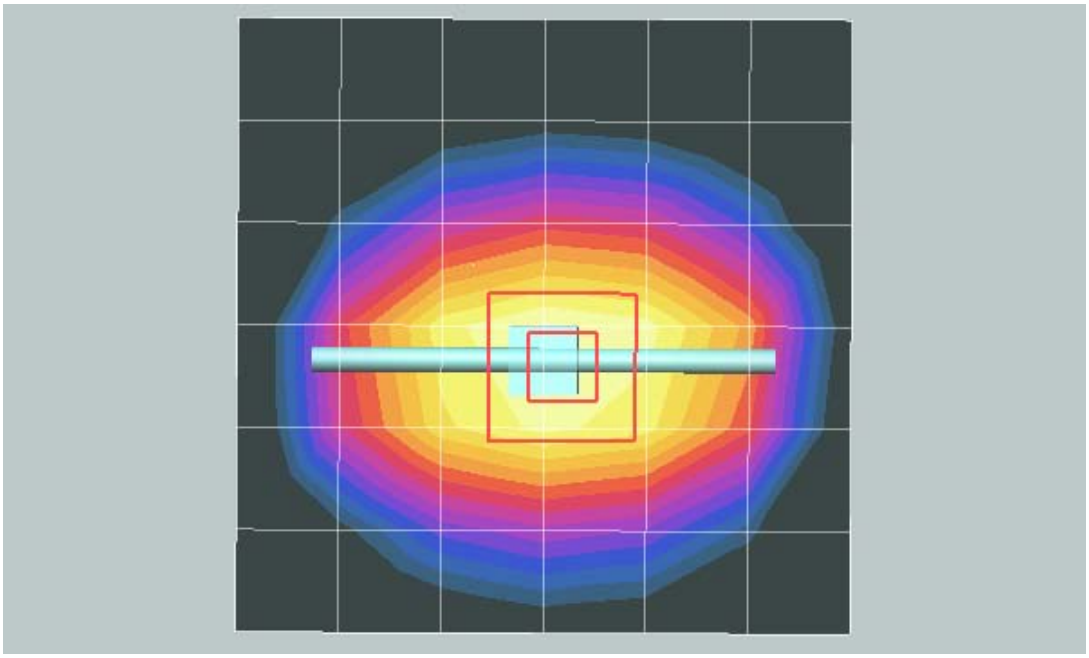


Date: 2004-04-27
Test Laboratory: TCC Salo

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d013
System Performance Check at 1900 MHz
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: Head, f = 1900 MHz; σ = 1.45 mho/m; ε_r = 38; ρ = 1000 kg/m^3 , t(liq.)=21.3°C
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(5.37, 5.37, 5.37); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1179
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

d=10mm, 250mW/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm
d=10mm, 250mW/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 92.8 V/m; Power Drift = -0.0 dB
Maximum value of SAR (measured) = 12.5 mW/g
Peak SAR (extrapolated) = 25.4 W/kg
SAR(1 g) = 11.5 mW/g; SAR(10 g) = 5.71 mW/g ; Worst case extrapolation

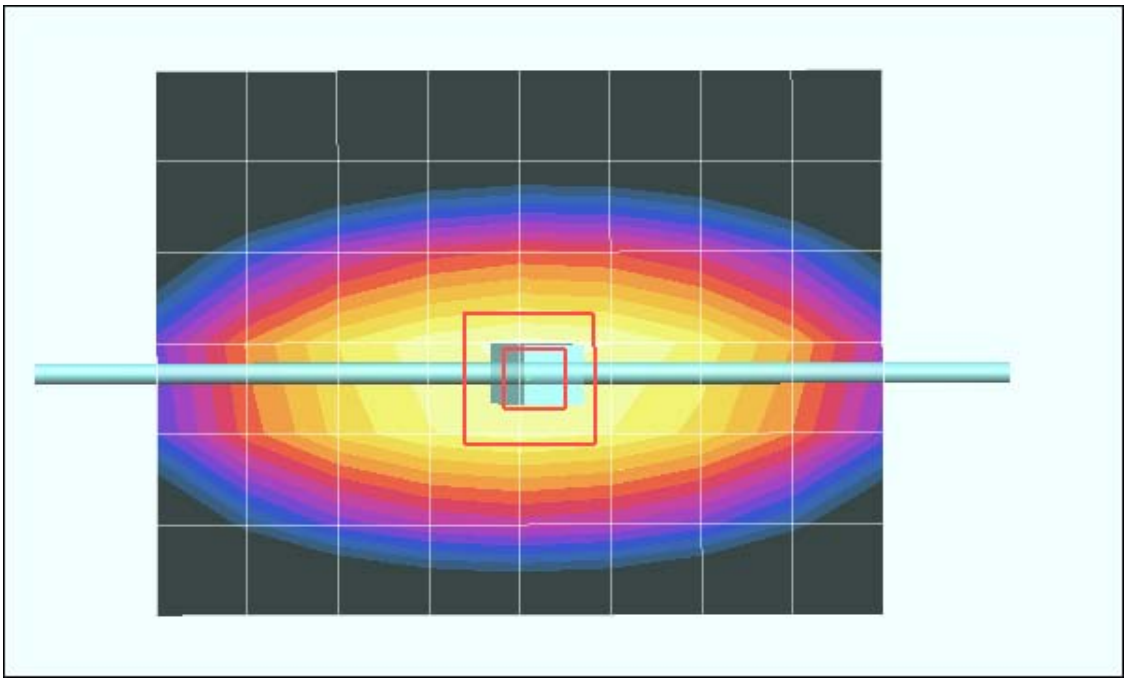


Date: 2004-04-29
Test Laboratory: TCC Salo

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 462
System Performance Check at 835 MHz
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: Body, f = 835 MHz; σ = 0.952 mho/m; ε_r = 54.3; ρ = 1000 kg/m^3 , t(liq.)=21.5°C
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(6.8, 6.8, 6.8); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 2; Type: Twin SAM 040 CA; Serial: TP - 1177
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

d=15mm, Pin=250mW/Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.5 V/m; Power Drift = 0.0 dB
Maximum value of SAR (measured) = 2.68 mW/g, Peak SAR (extrapolated) = 3.65 W/kg
SAR(1 g) = 2.48 mW/g; SAR(10 g) = 1.64 mW/g; Advanced extrapolation

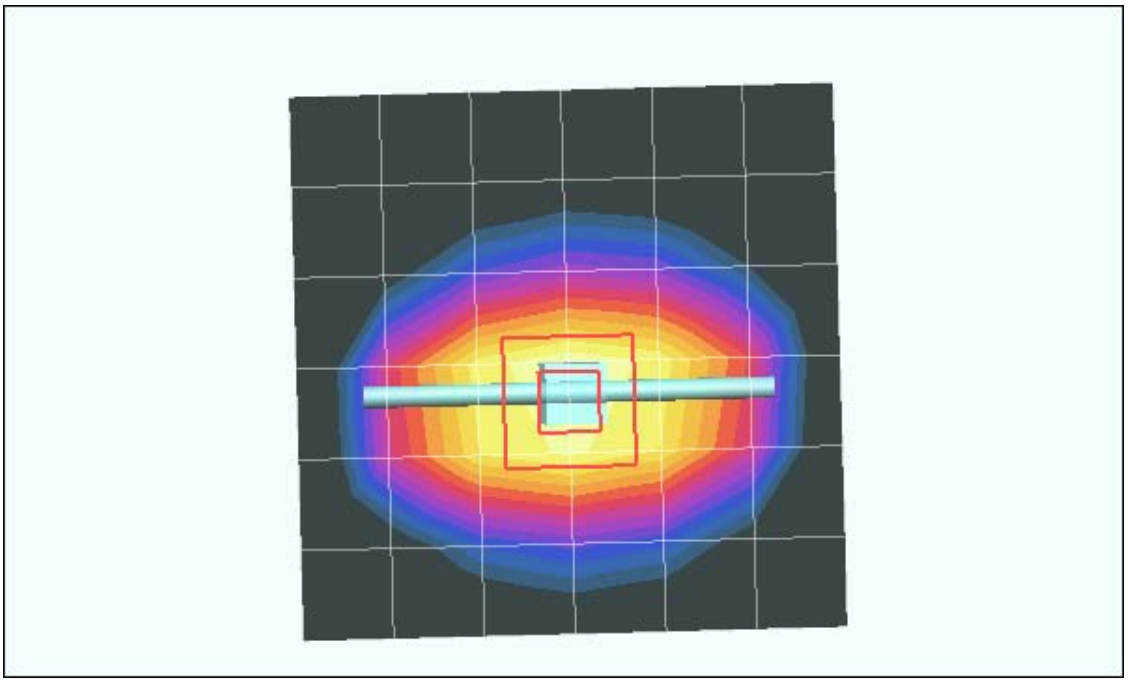


Date: 2004-04-29
Test Laboratory: TCC Salo

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d013
System Performance Check at 1900 MHz
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: Body, f = 1900 MHz; σ = 1.6 mho/m; ε_r = 50.5; ρ = 1000 kg/m^3 , t(liq.)=21.3°C
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(4.79, 4.79, 4.79); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1179
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

d=10mm, 250mW/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm
d=10mm, 250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.5 V/m; Power Drift = -0.0 dB
Maximum value of SAR (measured) = 11.5 mW/g, Peak SAR (extrapolated) = 17.3 W/kg
SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.31 mW/g; Advanced extrapolation



APPENDIX B: MEASUREMENT SCANS

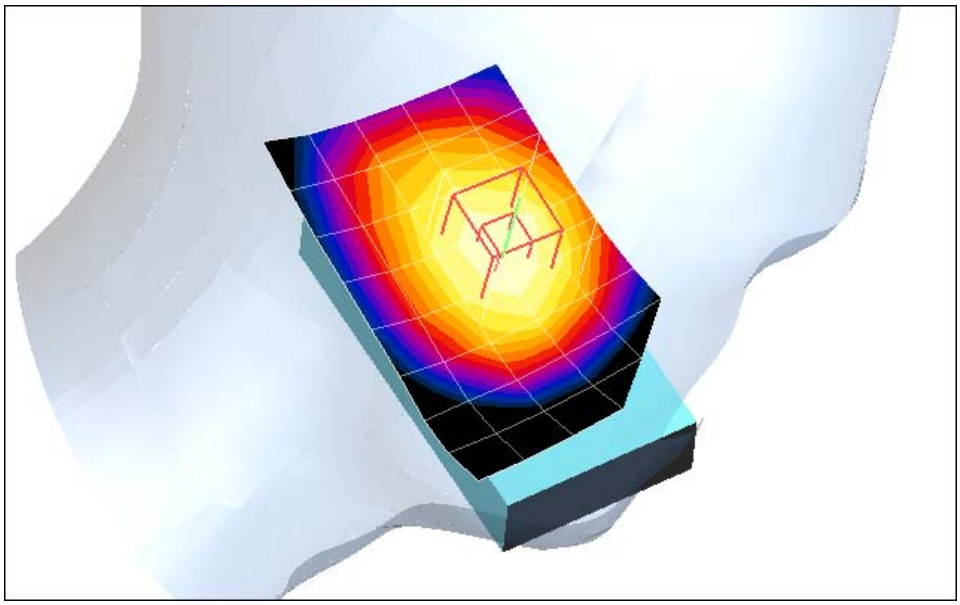
NHL-12, without MMC-card, Left Cheek, GSM 850 (high ch)

Date: 2004-04-28
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GSM850; Frequency: 849 MHz; Duty Cycle: 1:8.3
Medium: Head, f = 849 MHz; σ = 0.919 mho/m; ε_r = 41; ρ = 1000 kg/m^3 , t(liq.)=21.3°C
Phantom section: Left Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(6.98, 6.98, 6.98); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 2; Type: Twin SAM 040 CA; Serial: TP - 1177
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Cheek - High/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Cheek - High/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 28.1 V/m; Power Drift = 0.0 dB
Maximum value of SAR (measured) = 1.15 mW/g, Peak SAR (extrapolated) = 1.63 W/kg
SAR(1 g) = 1.11 mW/g; SAR(10 g) = 0.784 mW/g ; Worst case extrapolation

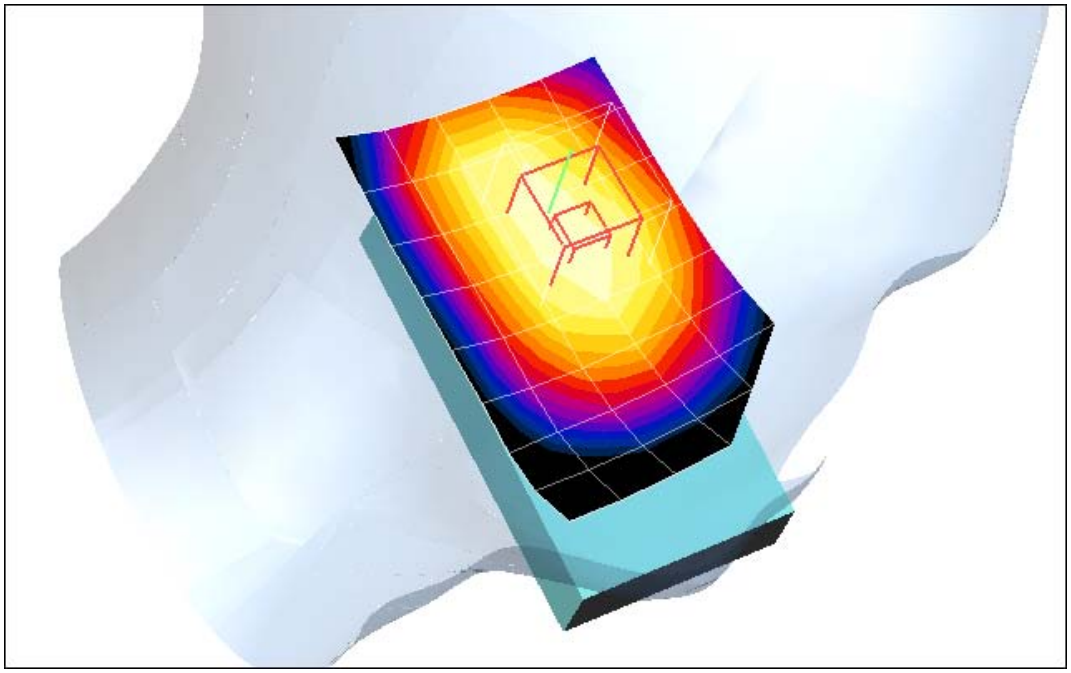


NHL-12, without MMC-card, Left Tilt, GSM 850 (mid ch)
Date: 2004-04-28
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GSM850; Frequency: 836 MHz;Duty Cycle: 1:8.3
Medium: Head, f = 836 MHz; σ = 0.908 mho/m; ε_r = 41.1; ρ = 1000 kg/m^3 ; t(liq.)=21.4°C
Phantom section: Left Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(6.98, 6.98, 6.98); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 2; Type: Twin SAM 040 CA; Serial: TP - 1177
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Tilt - Middle/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Tilt - Middle/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 28.6 V/m; Power Drift = 0.0 dB
Maximum value of SAR (measured) = 0.767 mW/g, Peak SAR (extrapolated) = 1.08 W/kg
SAR(1 g) = 0.738 mW/g; SAR(10 g) = 0.528 mW/g; Worst case extrapolation

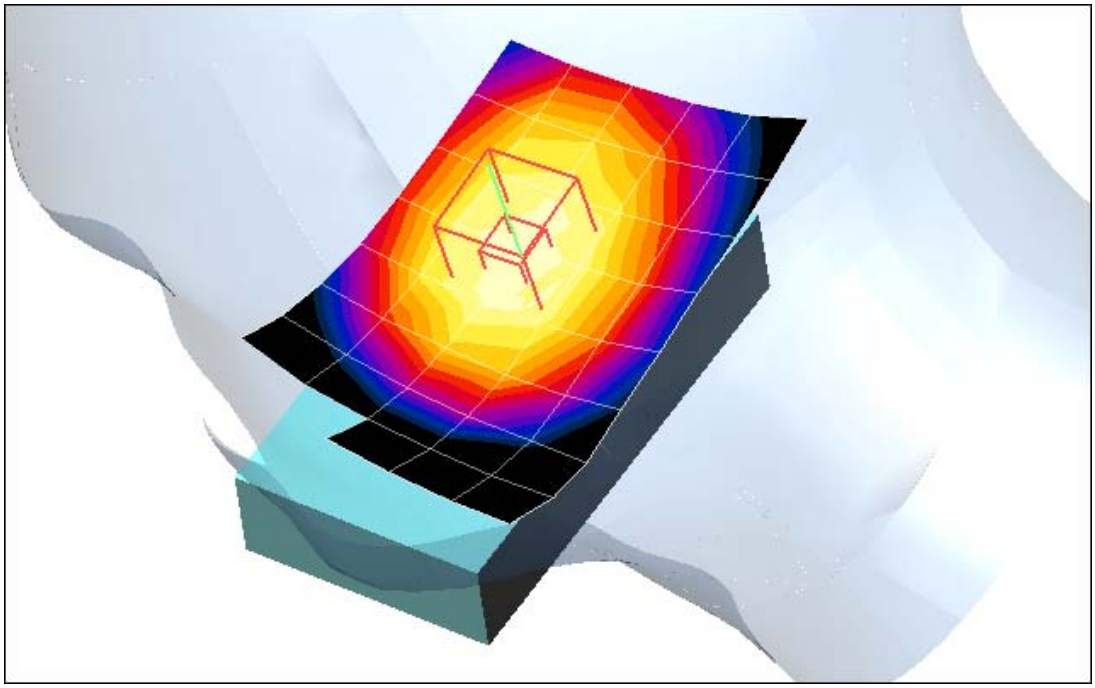


NHL-12, Without MMC-card, Right Cheek, GSM 850 (High ch)
Date: 2004-04-28
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GSM850; Frequency: 849 MHz; Duty Cycle: 1:8.3
Medium: Head, f = 849 MHz; σ = 0.919 mho/m; ε_r = 41; ρ = 1000 kg/m^3 , t(liq.)=21.0°C
Phantom section: Right Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(6.98, 6.98, 6.98); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 2; Type: Twin SAM 040 CA; Serial: TP - 1177
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Cheek - High/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Cheek - High/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 28.8 V/m; Power Drift = 0.1 dB
Maximum value of SAR (measured) = 1.16 mW/g, Peak SAR (extrapolated) = 1.61 W/kg
SAR(1 g) = 1.1 mW/g; SAR(10 g) = 0.777 mW/g; Worst case extrapolation

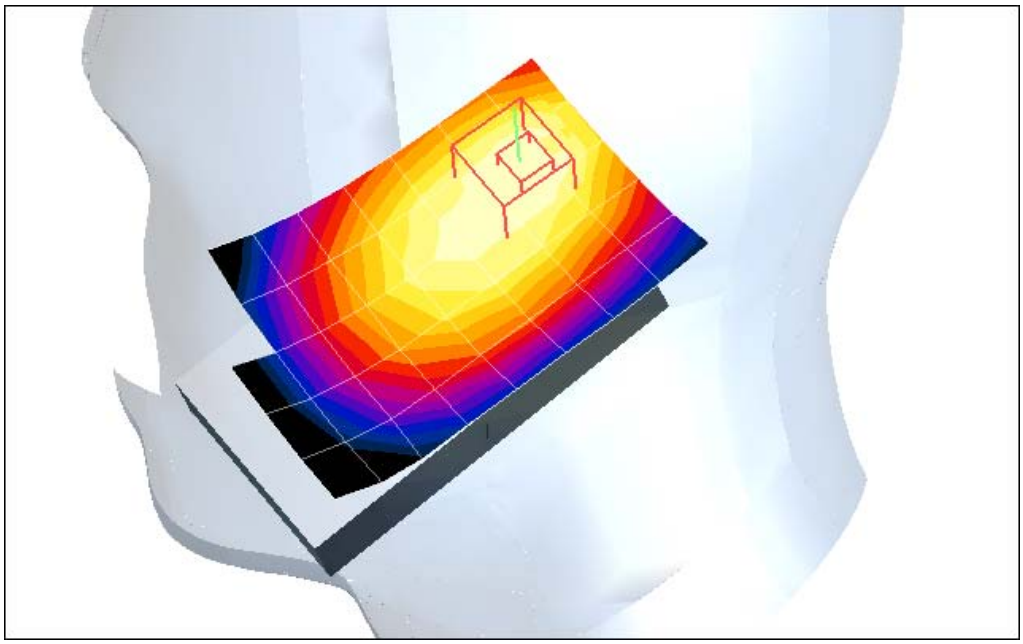


NHL-12, without MMC-card, Right Tilt, GSM 850 (Mid ch)
Date: 2004-04-28
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GSM850; Frequency: 836 MHz;Duty Cycle: 1:8.3
Medium: Head, f = 836 MHz; σ = 0.908 mho/m; ε_r = 41.1; ρ = 1000 kg/m^3 , t(liq.)=21.1°C
Phantom section: Right Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(6.98, 6.98, 6.98); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 2; Type: Twin SAM 040 CA; Serial: TP - 1177
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Tilt - Middle/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Tilt - Middle/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 28.1 V/m; Power Drift = 0.0 dB
Maximum value of SAR (measured) = 0.842 mW/g, Peak SAR (extrapolated) = 1.43 W/kg
SAR(1 g) = 0.802 mW/g; SAR(10 g) = 0.540 mW/g (on the boundary); **Worst case extrapolation**

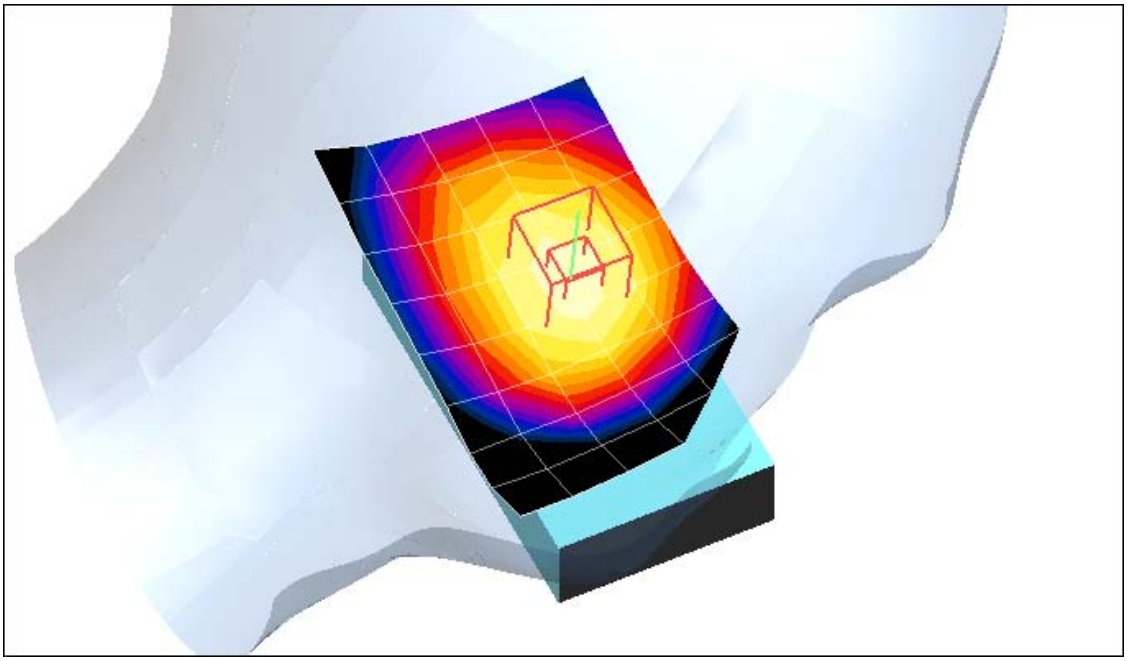


NHL-12, with MMC-card, Left Cheek, GSM 850 (high ch)
Date: 2004-04-28
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GSM850; Frequency: 849 MHz; Duty Cycle: 1:8.3
Medium: Head, f = 849 MHz; σ = 0.919 mho/m; ε_r = 41; ρ = 1000 kg/m^3 , t(liq.)=20.6°C
Phantom section: Left Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(6.98, 6.98, 6.98); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 2; Type: Twin SAM 040 CA; Serial: TP - 1177
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Cheek - High - WITH MMC/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Cheek - High - WITH MMC/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 27.6 V/m; Power Drift = 0.0 dB
Maximum value of SAR (measured) = 1.18 mW/g, Peak SAR (extrapolated) = 1.64 W/kg
SAR(1 g) = 1.13 mW/g; SAR(10 g) = 0.791 mW/g; Worst case extrapolation

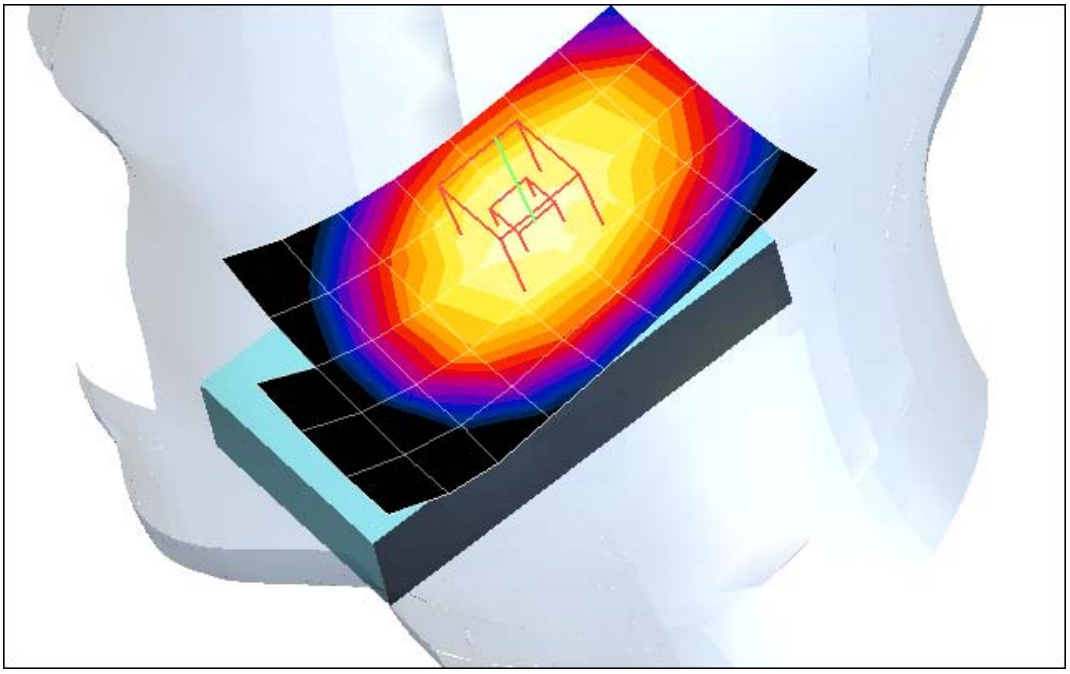


NHL-12, with MMC-card, Right Cheek, GSM 850 (mid ch)
Date: 2004-04-28
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GSM850; Frequency: 836 MHz;Duty Cycle: 1:8.3
Medium: Head f = 836 MHz; σ = 0.908 mho/m; ε_r = 41.1; ρ = 1000 kg/m^3 , t(liq.)=20.7°C
Phantom section: Right Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(6.98, 6.98, 6.98); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 2; Type: Twin SAM 040 CA; Serial: TP - 1177
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Cheek - Middle - WITH MMC/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Cheek - Middle - WITH MMC/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 28.8 V/m; Power Drift = 0.003 dB
Maximum value of SAR (measured) = 1.15 mW/g, Peak SAR (extrapolated) = 1.6 W/kg
SAR(1 g) = 1.09 mW/g; SAR(10 g) = 0.769 mW/g; Worst case extrapolation

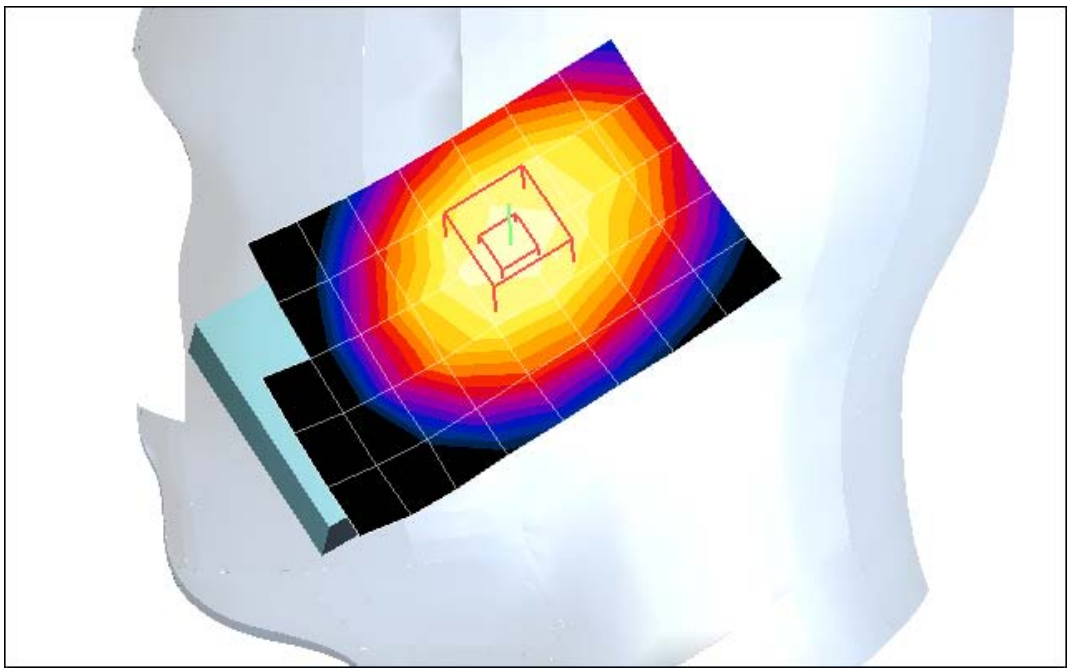


NHL-12, with MMC-card, Right Cheek, GSM 850 (high ch)
Date: 2004-04-28
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GSM850; Frequency: 849 MHz; Duty Cycle: 1:8.3
Medium: Head, f = 849 MHz; σ = 0.919 mho/m; ε_r = 41; ρ = 1000 kg/m^3 , t=20.7°C
Phantom section: Right Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(6.98, 6.98, 6.98); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 2; Type: Twin SAM 040 CA; Serial: TP - 1177
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Cheek - High - WITH MMC/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Cheek - High - WITH MMC/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 28.2 V/m; Power Drift = 0.0 dB
Maximum value of SAR (measured) = 1.14 mW/g, Peak SAR (extrapolated) = 1.57 W/kg
SAR(1 g) = 1.09 mW/g; SAR(10 g) = 0.765 mW/g; Worst case extrapolation

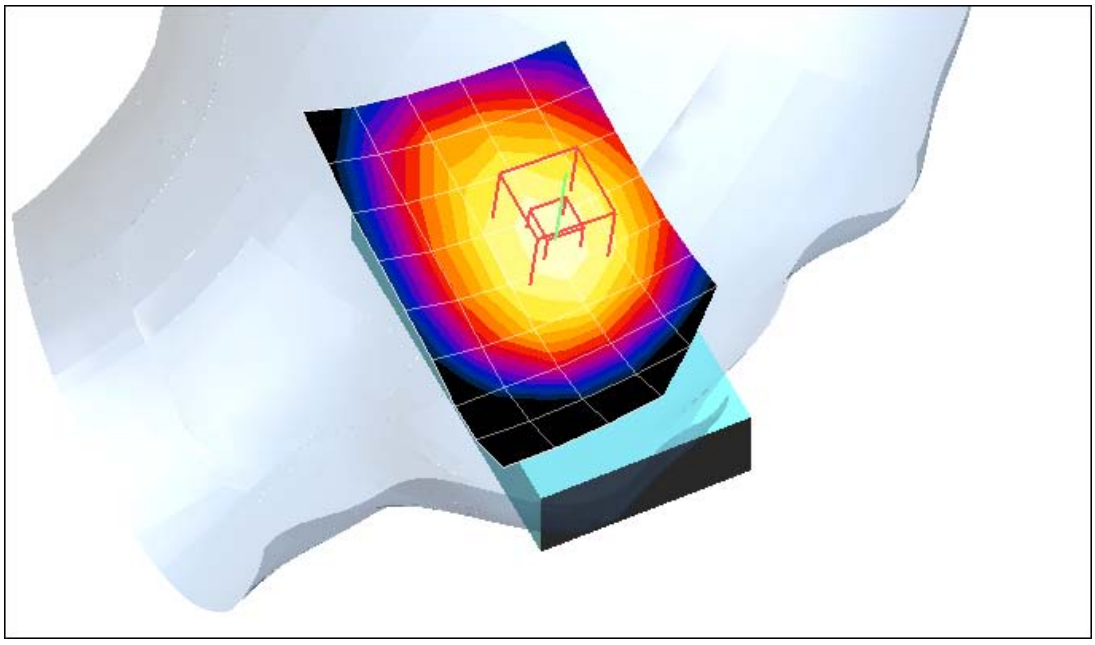


NHL-12, with MMC-card, BT active, Left Cheek, GSM 850 (High ch)
Date: 2004-04-28
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GSM850; Frequency: 849 MHz;Duty Cycle: 1:8.3
Medium: Head, f = 849 MHz; σ = 0.919 mho/m; ε_r = 41; ρ = 1000 kg/m^3 , t(liq.)=20.5°C
Phantom section: Left Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(6.98, 6.98, 6.98); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 2; Type: Twin SAM 040 CA; Serial: TP - 1177
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Cheek - High - WITH MMC - BT ACTIVE/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Cheek - High - WITH MMC - BT ACTIVE/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 27.6 V/m; Power Drift = 0.1 dB
Maximum value of SAR (measured) = 1.2 mW/g, Peak SAR (extrapolated) = 1.7 W/kg
SAR(1 g) = 1.16 mW/g; SAR(10 g) = 0.809 mW/g; Worst case extrapolation



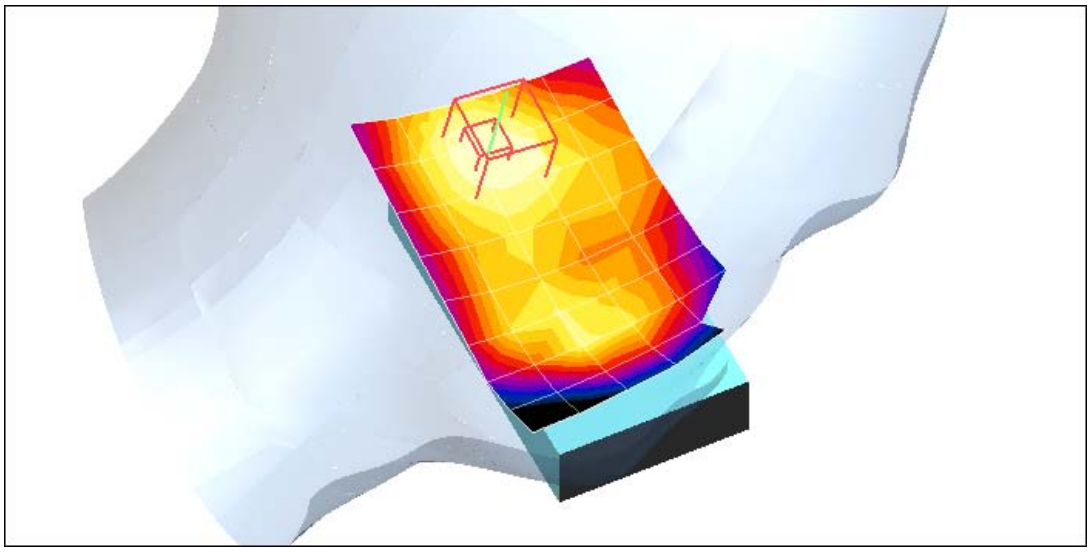
NHL-12, without MMC-card, Left Cheek, GSM 1900 (Mid ch)
Date: 2004-04-27
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GSM1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium: Head, f = 1880 MHz; σ = 1.44 mho/m; ε_r = 38.1; ρ = 1000 kg/m^3 ; t(liq.)=21.1°C
Phantom section: Left Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(5.37, 5.37, 5.37); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1179
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Cheek - Middle/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Cheek - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0 (upper one): Measur. grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 16.1 V/m; Power Drift = -0.1 dB
Maximum value of SAR (measured) = 0.401 mW/g, Peak SAR (extrapolated) = 0.720 W/kg
SAR(1 g) = 0.376 mW/g; SAR(10 g) = 0.217 mW/g; Worst case extrapolation

Cheek - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 1 (lower one): Measur. grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 16.1 V/m; Power Drift = -0.1 dB
Maximum value of SAR (measured) = 0.311 mW/g, Peak SAR (extrapolated) = 0.502 W/kg
SAR(1 g) = 0.293 mW/g; SAR(10 g) = 0.169 mW/g; Worst case extrapolation

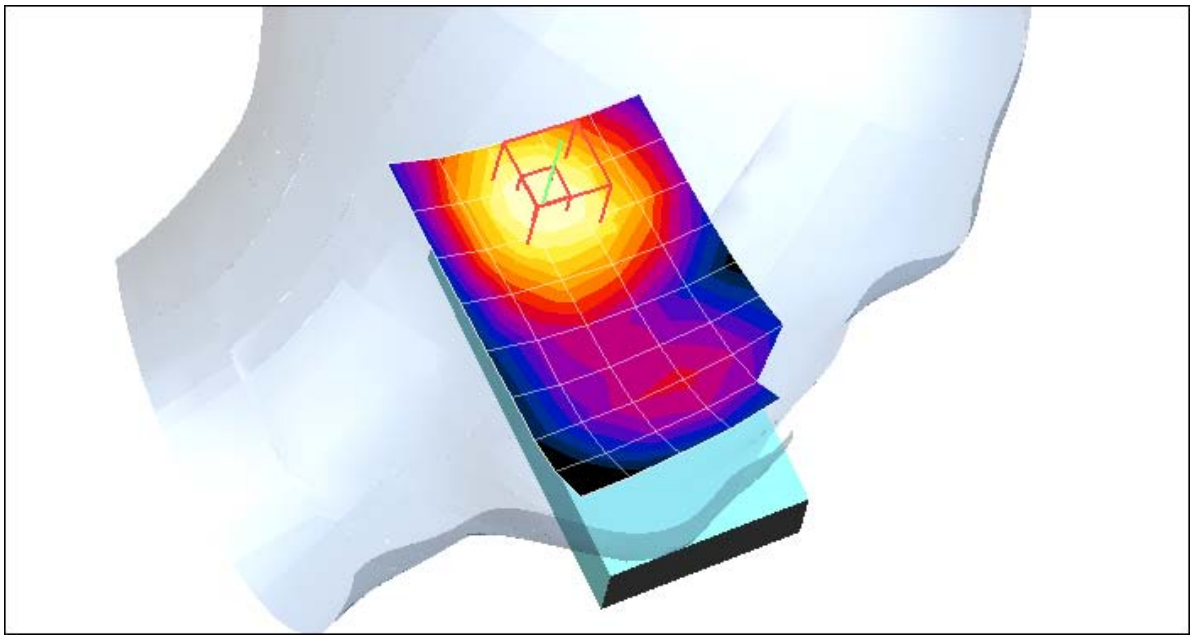


NHL-12, without MMC-card, Left Tilt, GSM 1900 (Mid ch)
Date: 2004-04-27
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium: Head, f = 1880 MHz; σ = 1.44 mho/m; ε_r = 38.1; ρ = 1000 kg/m^3 ; t(liq.)=20.9°C
Phantom section: Left Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(5.37, 5.37, 5.37); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1179
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Tilt - Middle/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Tilt - Middle/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 19.8 V/m; Power Drift = -0.0 dB
Maximum value of SAR (measured) = 0.563 mW/g, Peak SAR (extrapolated) = 1.01 W/kg
SAR(1 g) = 0.527 mW/g; SAR(10 g) = 0.295 mW/g; Worst case extrapolation

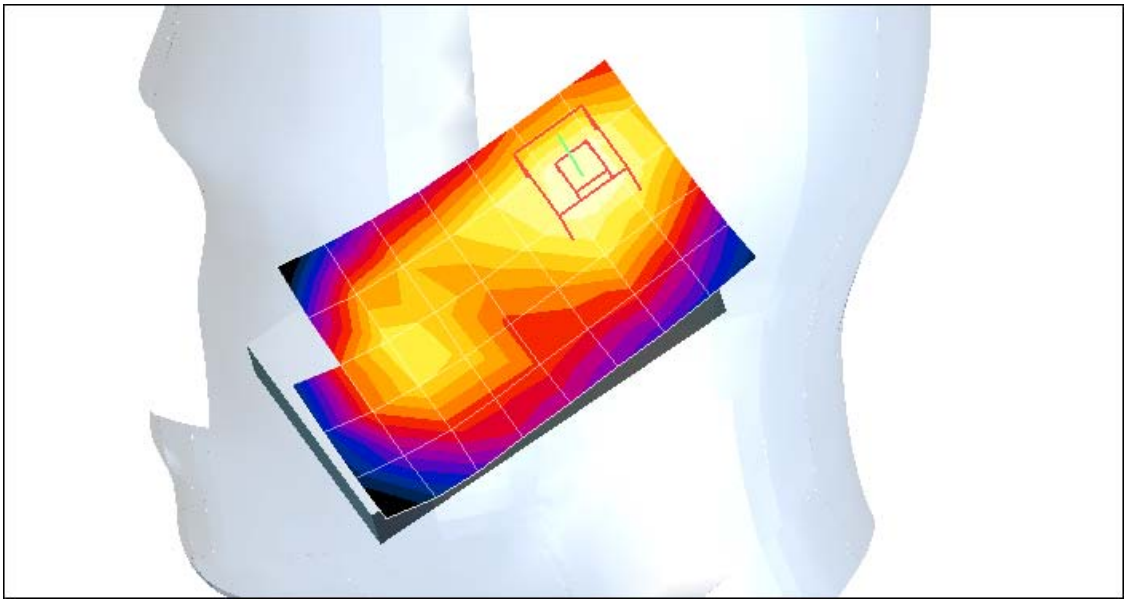


NHL-12, without MMC-card, Right Cheek, GSM 1900 (Mid ch)
Date: 2004-04-27
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium: Head, f = 1880 MHz; σ = 1.44 mho/m; ε_r = 38.1; ρ = 1000 kg/m^3 ; t(liq.)=20.8°C
Phantom section: Right Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(5.37, 5.37, 5.37); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1179
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Cheek - Middle/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Cheek - Middle/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 16.9 V/m; Power Drift = -0.1 dB
Maximum value of SAR (measured) = 0.533 mW/g, Peak SAR (extrapolated) = 1.05 W/kg
SAR(1 g) = 0.500 mW/g; SAR(10 g) = 0.277 mW/g; Worst case extrapolation

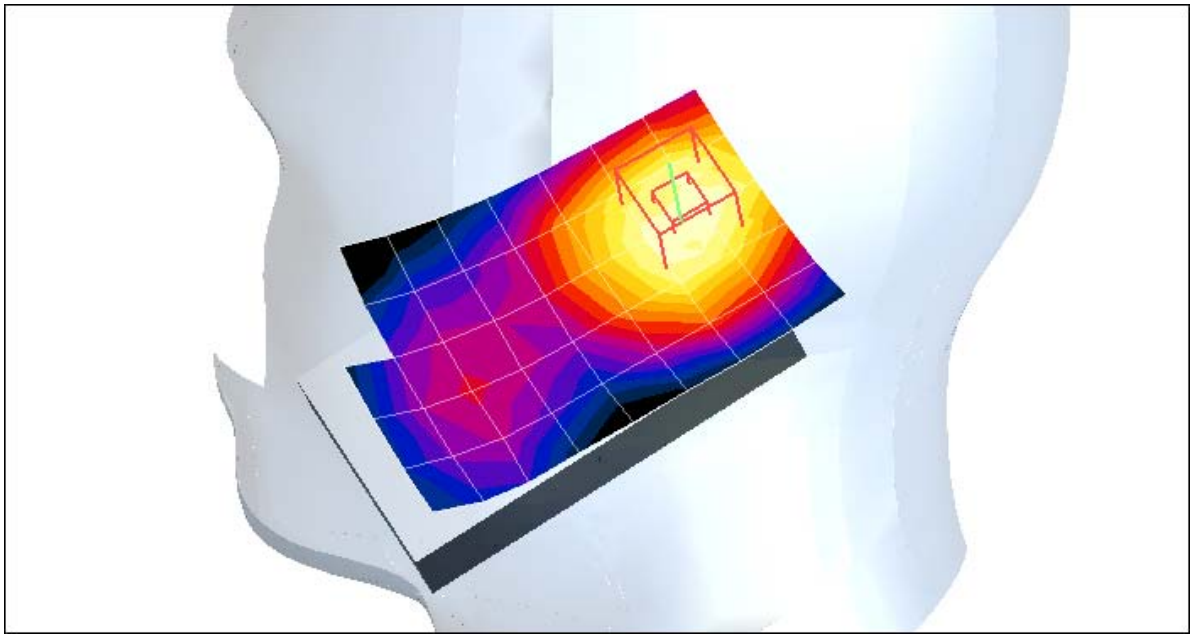


NHL-12, without MMC-card, Right Tilt, GSM 1900 (Mid ch)
Date: 2004-04-27
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GSM1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium: Head, f = 1880 MHz; σ = 1.44 mho/m; ε_r = 38.1; ρ = 1000 kg/m^3 ; t(liq.)=20.8°C
Phantom section: Right Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(5.37, 5.37, 5.37); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1179
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Tilt - Middle/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Tilt - Middle/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 19.9 V/m; Power Drift = -0.1 dB
Maximum value of SAR (measured) = 0.606 mW/g, Peak SAR (extrapolated) = 1.16 W/kg
SAR(1 g) = 0.582 mW/g; SAR(10 g) = 0.328 mW/g; Worst case extrapolation

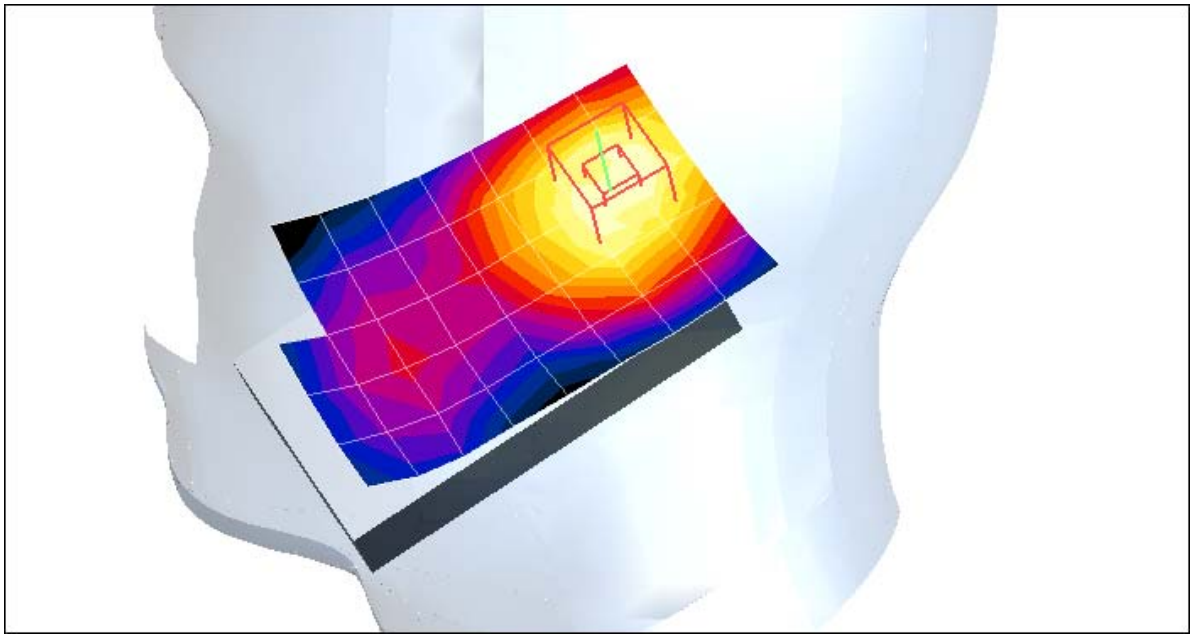


NHL-12, with MMC-card, Right Tilt, GSM 1900 (Mid ch)
Date: 2004-04-27
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium: Head, f = 1880 MHz; σ = 1.44 mho/m; ε_r = 38.1; ρ = 1000 kg/m^3 ; t(liq.)=20.6°C
Phantom section: Right Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(5.37, 5.37, 5.37); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1179
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Tilt - Middle WITH MMC/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Tilt - Middle WITH MMC/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 19.7 V/m; Power Drift = -0.1 dB
Maximum value of SAR (measured) = 0.600 mW/g, Peak SAR (extrapolated) = 1.14 W/kg
SAR(1 g) = 0.575 mW/g; SAR(10 g) = 0.322 mW/g; Worst case extrapolation

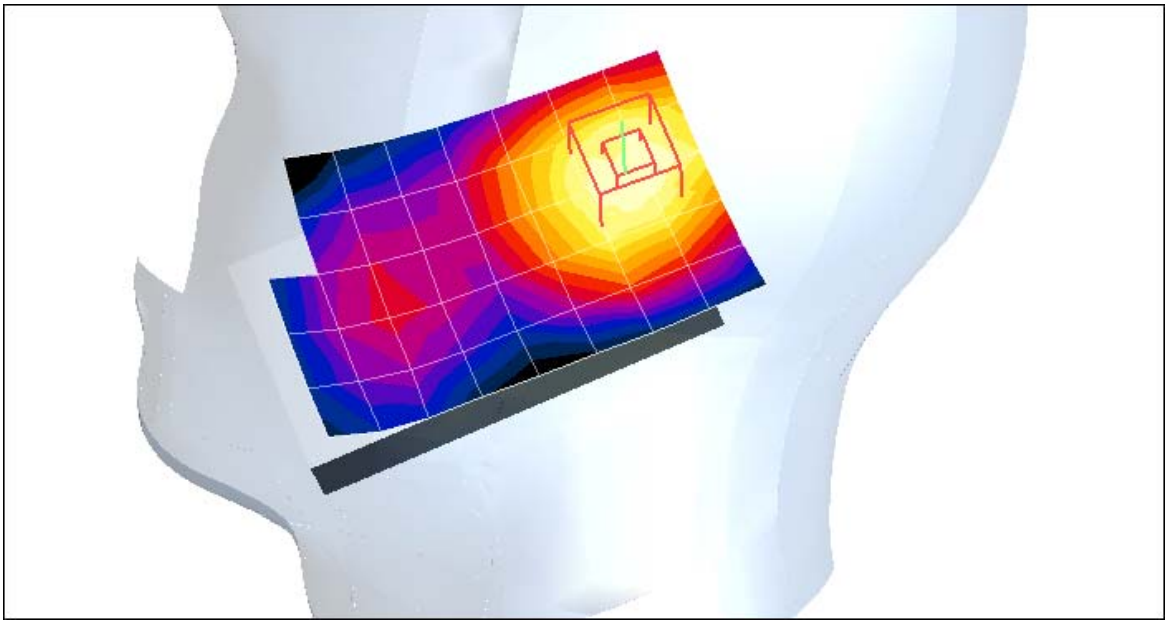


NHL-12, without MMC-card, BT active, Right Tilt, GSM 1900 (Mid ch)
Date: 2004-04-27
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium: Head, f = 1880 MHz; σ = 1.44 mho/m; ε_r = 38.1; ρ = 1000 kg/m^3 : t(liq)=20.8°C
Phantom section: Right Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(5.37, 5.37, 5.37); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1179
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Tilt - Middle WITH BT ACTIVE/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Tilt - Middle WITH BT ACTIVE/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 19.9 V/m; Power Drift = -0.1 dB
Maximum value of SAR (measured) = 0.617 mW/g, Peak SAR (extrapolated) = 1.17 W/kg
SAR(1 g) = 0.583 mW/g; SAR(10 g) = 0.325 mW/g; Worst case extrapolation

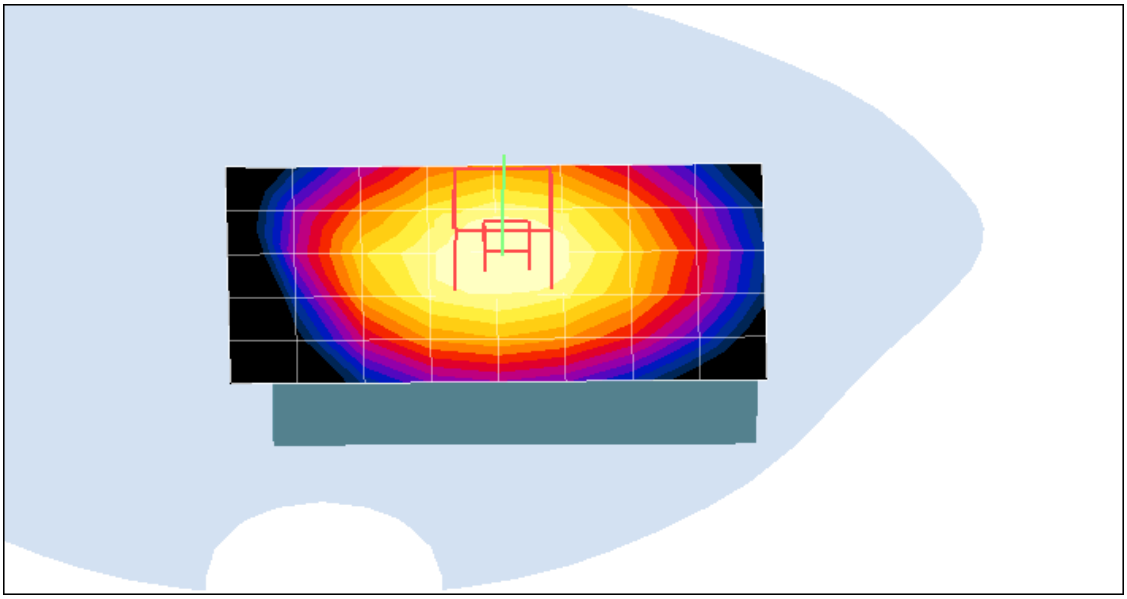


NHL-12, without MMC-card, without headset, Body 2.2 cm, GSM 850 (Low ch)
Date: 2004-04-29
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GSM850; Frequency: 824 MHz; Duty Cycle: 1:8.3
Medium: Body, f = 824 MHz; σ = 0.941 mho/m; ε_r = 54.4; ρ = 1000 kg/m^3 ; t(liq.)=20.8°C
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(6.8, 6.8, 6.8); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 2; Type: Twin SAM 040 CA; Serial: TP - 1177
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Body-Low/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Body-Low/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 18 V/m; Power Drift = 0.0 dB
Maximum value of SAR (measured) = 0.738 mW/g, Peak SAR (extrapolated) = 1.03 W/kg
SAR(1 g) = 0.703 mW/g; SAR(10 g) = 0.505 mW/g; Worst case extrapolation

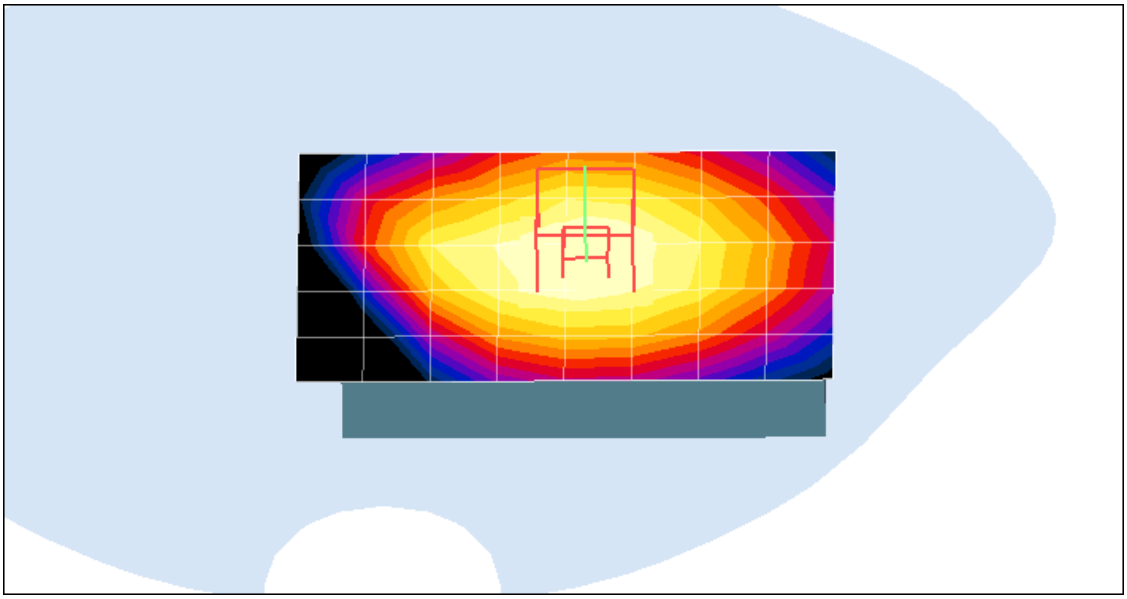


NHL-12, without MMC-card, with HDS-3, Body 2.2 cm, GSM 850 (Mid ch)
Date: 2004-04-29
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GSM850; Frequency: 836 MHz; Duty Cycle: 1:8.3
Medium: Body, f = 836 MHz; σ = 0.953 mho/m; ε_r = 54.3; ρ = 1000 kg/m^3 ; t(liq.)=20.6°C
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(6.8, 6.8, 6.8); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 2; Type: Twin SAM 040 CA; Serial: TP - 1177
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Body - Middle - HDS-3/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Body - Middle - HDS-3/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 15.2 V/m; Power Drift = 0.0 dB
Maximum value of SAR (measured) = 0.438 mW/g, Peak SAR (extrapolated) = 0.619 W/kg
SAR(1 g) = 0.419 mW/g; SAR(10 g) = 0.301 mW/g; Worst case extrapolation

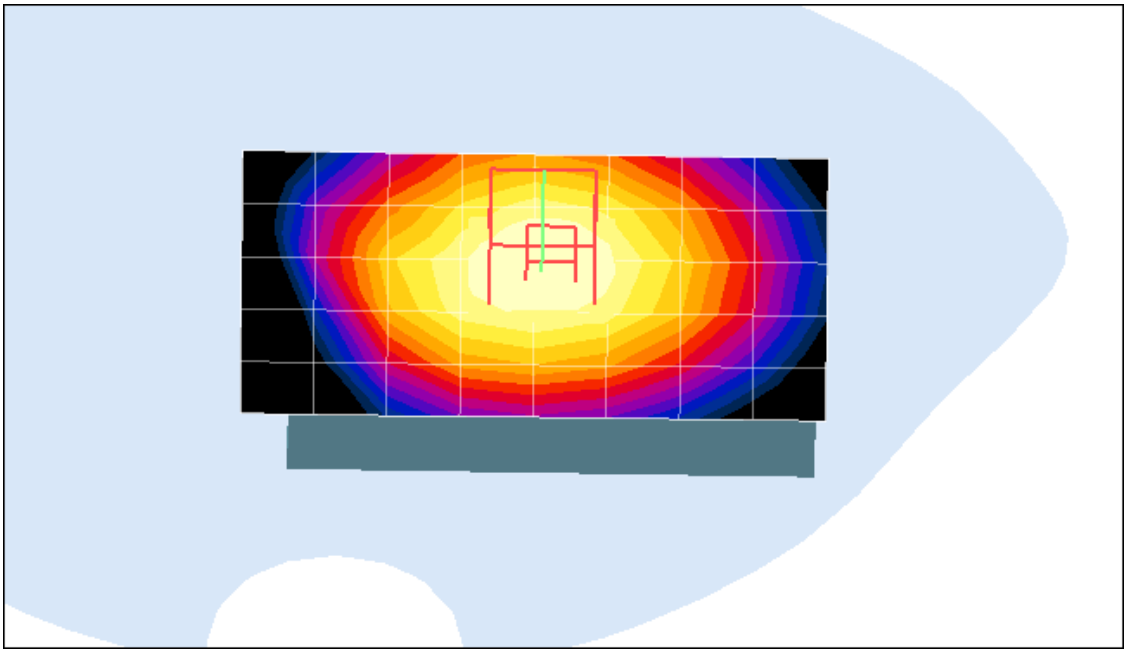


NHL-12, with MMC-card, without headset, Body 2.2 cm, GSM 850 (Low ch)
Date: 2004-04-29
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GSM850; Frequency: 824 MHz; Duty Cycle: 1:8.3
Medium: Body, f = 824 MHz; σ = 0.941 mho/m; ε_r = 54.4; ρ = 1000 kg/m^3 : t(liq.)=20.3 °C
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(6.8, 6.8, 6.8); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 2; Type: Twin SAM 040 CA; Serial: TP - 1177
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Body-Low - WITH MMC/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Body-Low - WITH MMC/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 18 V/m; Power Drift = 0.007 dB
Maximum value of SAR (measured) = 0.735 mW/g, Peak SAR (extrapolated) = 1.02 W/kg
SAR(1 g) = 0.700 mW/g; SAR(10 g) = 0.501 mW/g; Worst case extrapolation

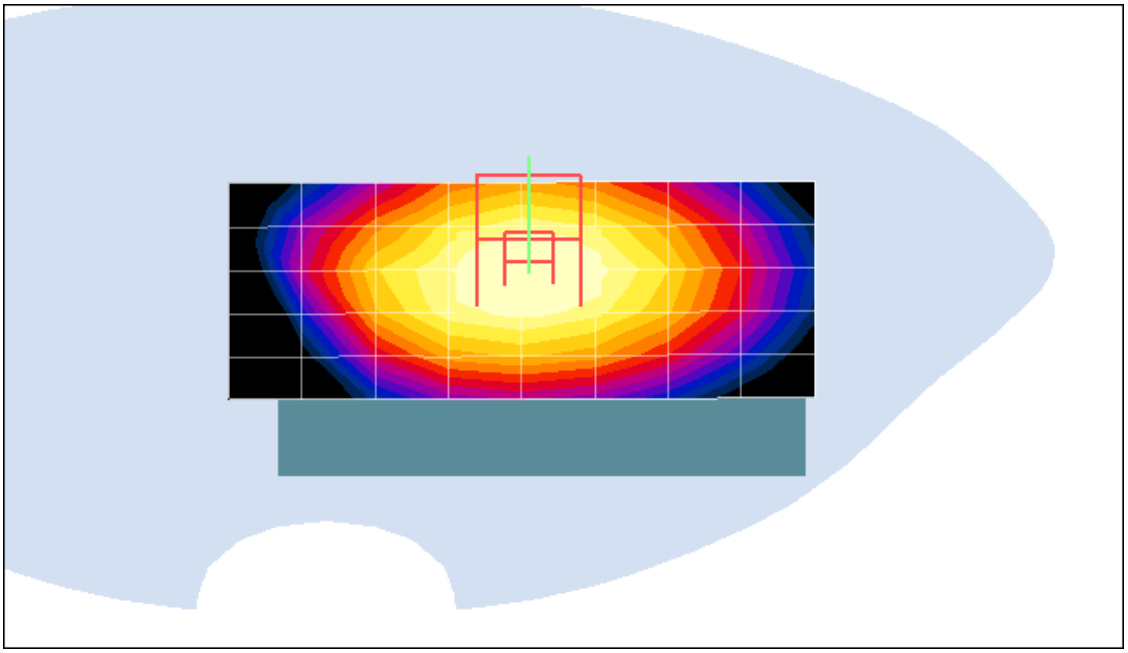


NHL-12, without MMC-card, without headset, BT active, Body 2.2 cm, GSM 850 (Low ch)
Date: 2004-04-29
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GSM850; Frequency: 824 MHz; Duty Cycle: 1:8.3
Medium: Body f = 824 MHz; σ = 0.941 mho/m; ε_r = 54.4; ρ = 1000 kg/m^3 ; t(liq.)=20.2°C
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(6.8, 6.8, 6.8); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 2; Type: Twin SAM 040 CA; Serial: TP - 1177
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Body-Low - BT ACTIVE/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Body-Low - BT ACTIVE/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 17.7 V/m; Power Drift = -0.01 dB
Maximum value of SAR (measured) = 0.696 mW/g, Peak SAR (extrapolated) = 0.982 W/kg
SAR(1 g) = 0.669 mW/g; SAR(10 g) = 0.481 mW/g; Worst case extrapolation

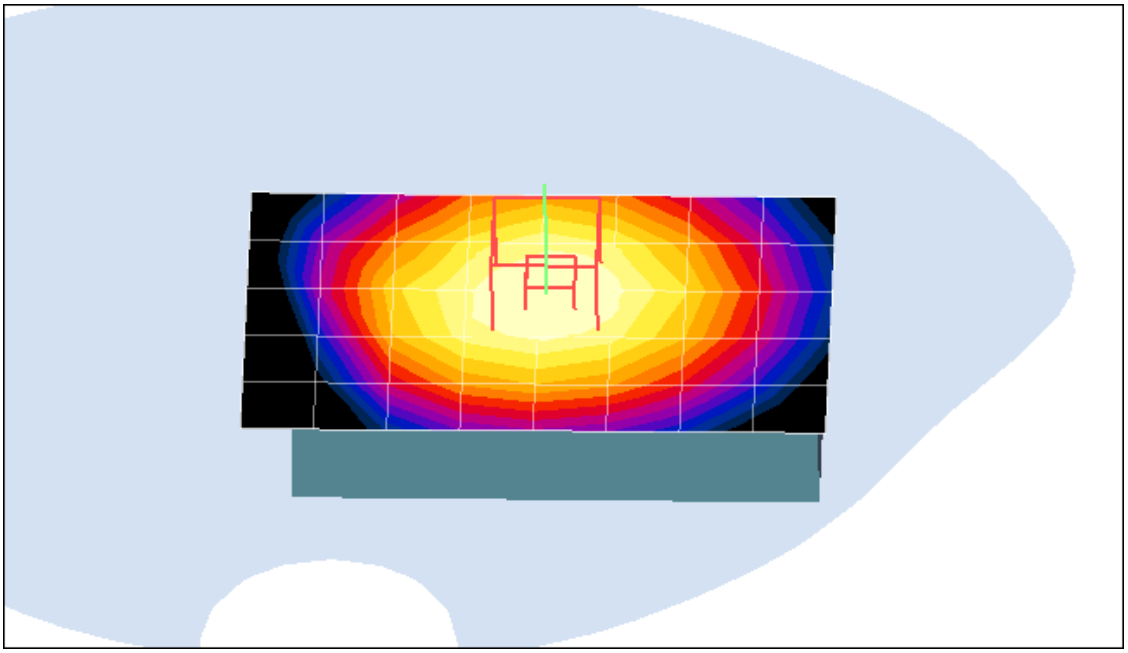


NHL-12, without MMC-card, without headset, Body 2.2 cm, GPRS850/2-slot TX (Low ch)
Date: 2004-04-29
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GPRS850; Frequency: 824 MHz;Duty Cycle: 1:4.2
Medium: Body, f = 824 MHz; σ = 0.941 mho/m; ε_r = 54.4; ρ = 1000 kg/m^3 ; t(liq.)=20.2°C
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(6.8, 6.8, 6.8); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 2; Type: Twin SAM 040 CA; Serial: TP - 1177
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Body-Low/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Body-Low/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 15.5 V/m; Power Drift = 0.005 dB
Maximum value of SAR (measured) = 0.545 mW/g, Peak SAR (extrapolated) = 0.752 W/kg
SAR(1 g) = 0.517 mW/g; SAR(10 g) = 0.371 mW/g; Worst case extrapolation

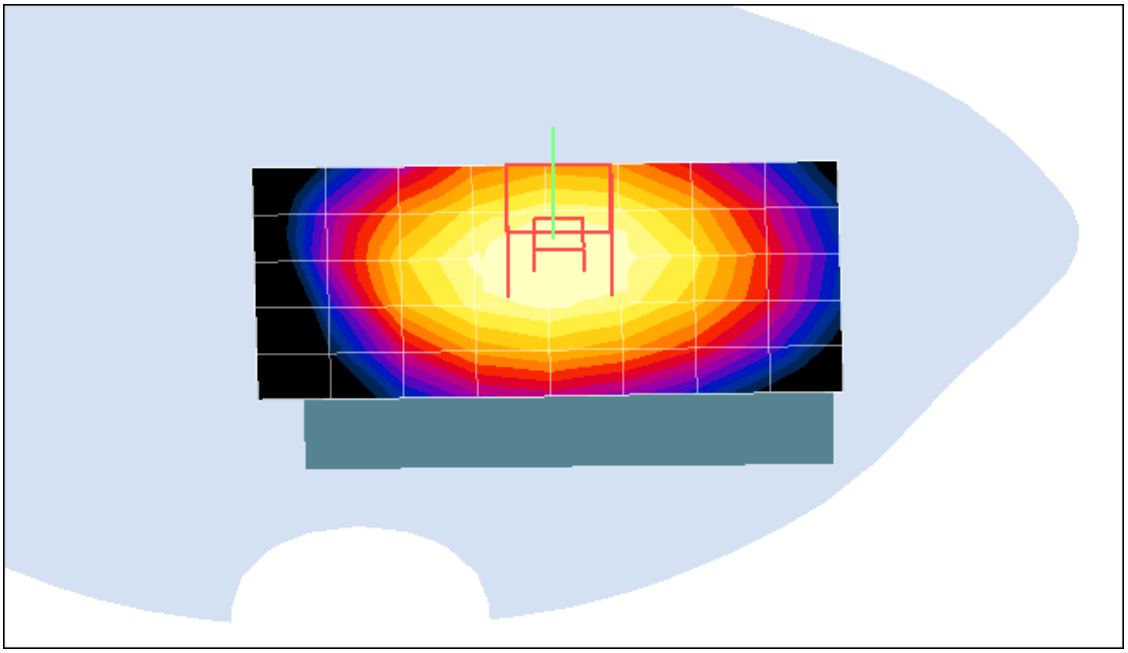


NHL-12, without MMC-card, without headset, Body 2.2 cm, E-GPRS850/1-slot TX (Mid ch)
Date: 2004-04-29
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: E-GPRS 850; Frequency: 836 MHz; Duty Cycle: 1:8.3
Medium: Body, f = 836 MHz; σ = 0.953 mho/m; ε_r = 54.3; ρ = 1000 kg/m^3 ; t(liq.)=20.9°C
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(6.8, 6.8, 6.8); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 2; Type: Twin SAM 040 CA; Serial: TP - 1177
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Body - Middle/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Body - Middle/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 8.25 V/m; Power Drift = -0.1 dB
Maximum value of SAR (measured) = 0.156 mW/g, Peak SAR (extrapolated) = 0.221 W/kg
SAR(1 g) = 0.149 mW/g; SAR(10 g) = 0.108 mW/g; Worst case extrapolation

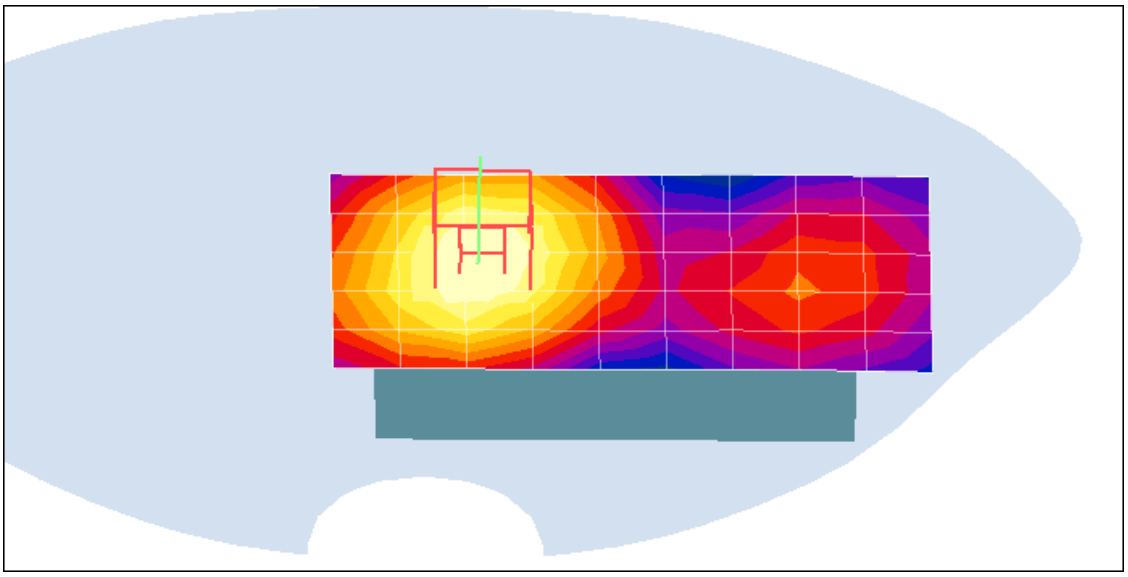


NHL-12, without MMC-card, without headset, Body 2.2 cm, GPRS1900/2-slot TX (Low ch)
Date: 2004-04-29
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GPRS1900; Frequency: 1850.2 MHz;Duty Cycle: 1:4.2
Medium: Body, f = 1850.2 MHz; σ = 1.56 mho/m; ε_r = 50.8; ρ = 1000 kg/m^3 ; t(liq.)=20.8°C
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(4.79, 4.79, 4.79); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1179
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Body - Low/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm
Body - Low/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 18.6 V/m; Power Drift = 0.01 dB
Maximum value of SAR (measured) = 0.770 mW/g, Peak SAR (extrapolated) = 1.48 W/kg
SAR(1 g) = 0.735 mW/g; SAR(10 g) = 0.433 mW/g; Worst case extrapolation

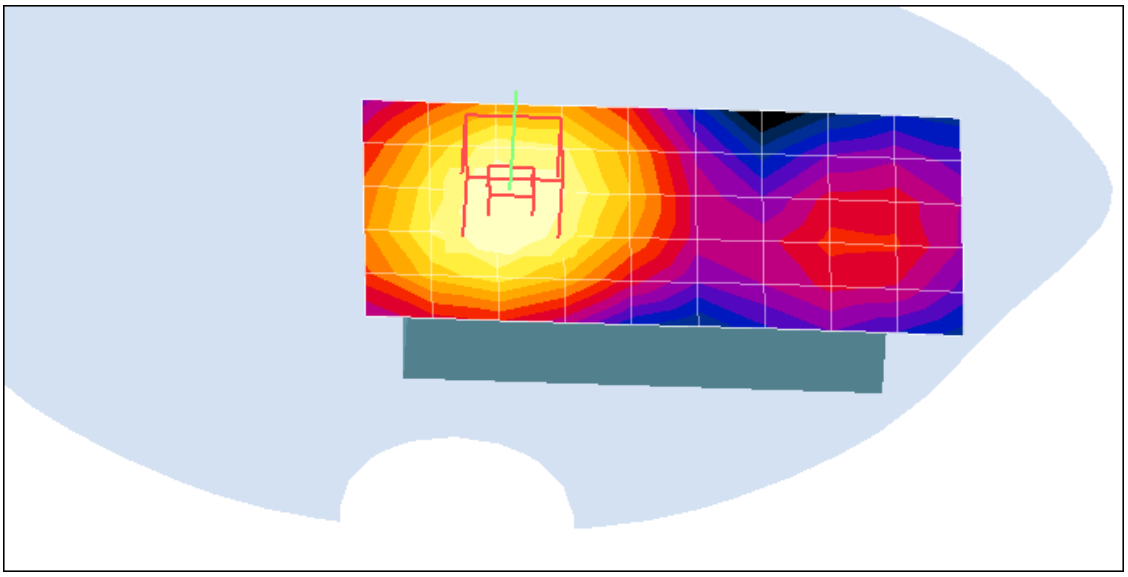


NHL-12, without MMC-card, with HDS-3, Body 2.2 cm, GPRS1900/2-slot TX (Low ch)
Date: 2004-04-29
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GPRS1900; Frequency: 1850.2 MHz; Duty Cycle: 1:4.2
Medium: Body, f = 1850.2 MHz; σ = 1.56 mho/m; ε_r = 50.8; ρ = 1000 kg/m^3 ; t(liq.)=20.6°C
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(4.79, 4.79, 4.79); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1179
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Body - Low - HDS-3/Area Scan (6x10x1): Measurement grid: dx=15mm, dy=15mm
Body - Low - HDS-3/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 19 V/m; Power Drift = -0.0 dB
Maximum value of SAR (measured) = 0.748 mW/g, Peak SAR (extrapolated) = 1.41 W/kg
SAR(1 g) = 0.717 mW/g; SAR(10 g) = 0.430 mW/g; Worst case extrapolation

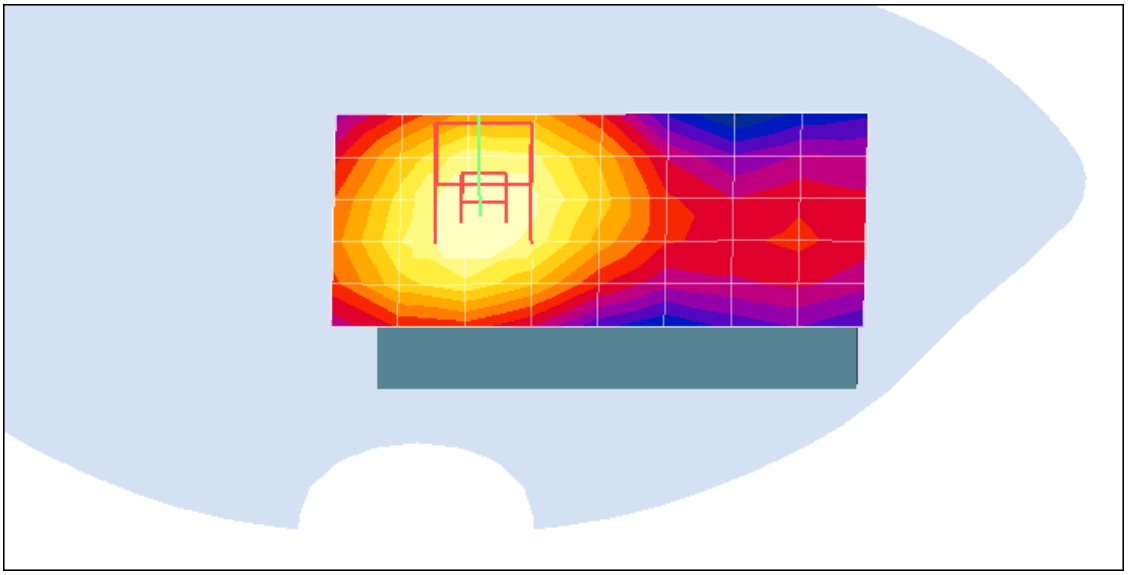


NHL-12, with MMC-card, without headset, Body 2.2 cm, GPRS1900/2-slot TX (Low ch)
Date: 2004-04-29
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GPRS1900; Frequency: 1850.2 MHz;Duty Cycle: 1:4.2
Medium: Body, f = 1850.2 MHz; σ = 1.56 mho/m; ε_r = 50.8; ρ = 1000 kg/m^3 ; t(liq.)=20.5°C
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(4.79, 4.79, 4.79); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1179
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Body - Low - WITH MMC/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Body - Low - WITH MMC/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 19 V/m; Power Drift = -0.0 dB
Maximum value of SAR (measured) = 0.766 mW/g, Peak SAR (extrapolated) = 1.48 W/kg
SAR(1 g) = 0.739 mW/g; SAR(10 g) = 0.440 mW/g; Worst case extrapolation

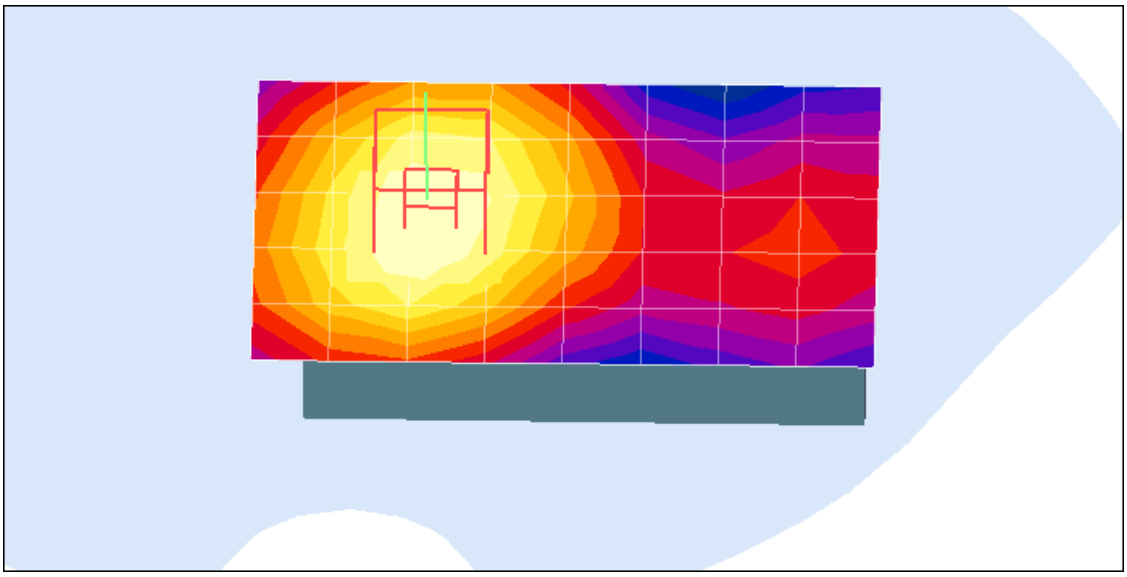


NHL-12, with MMC-card, without headset, BT active, Body 2.2 cm, GPRS1900/2-slot TX (Low ch)
Date: 2004-04-29
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GPRS1900; Frequency: 1850.2 MHz; Duty Cycle: 1:4.2
Medium: Body, f = 1850.2 MHz; σ = 1.56 mho/m; ε_r = 50.8; ρ = 1000 kg/m^3 ; t(liq.)=20.4°C
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(4.79, 4.79, 4.79); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1179
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Body - Low - WITH MMC - BT ACTIVE/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Body - Low - WITH MMC - BT ACTIVE/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 18.5 V/m; Power Drift = -0.0 dB
Maximum value of SAR (measured) = 0.738 mW/g, Peak SAR (extrapolated) = 1.43 W/kg
SAR(1 g) = 0.706 mW/g; SAR(10 g) = 0.419 mW/g; Worst case extrapolation

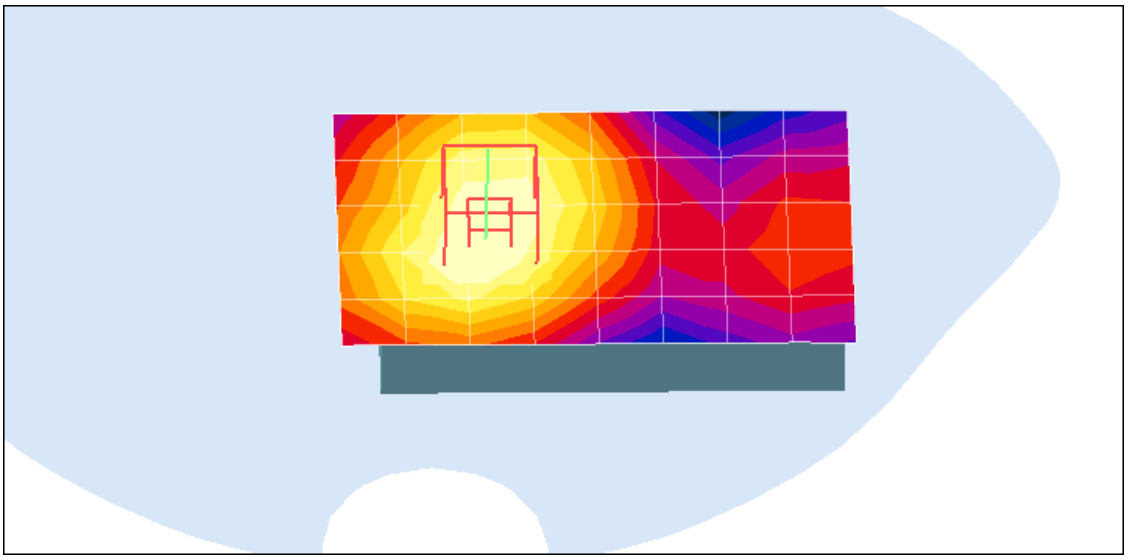


NHL-12, without MMC-card, without headset, Body 2.2 cm, GSM1900
Date: 2004-04-29
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium: f = 1880 MHz; σ = 1.58 mho/m; ε_r = 50.6; ρ = 1000 kg/m^3 ; t(liq.)=20.9°C
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(4.79, 4.79, 4.79); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1179
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Body - Mid/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Body - Mid/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 12.7 V/m; Power Drift = -0.0 dB
Maximum value of SAR (measured) = 0.394 mW/g, Peak SAR (extrapolated) = 0.754 W/kg
SAR(1 g) = 0.375 mW/g; SAR(10 g) = 0.224 mW/g; Worst case extrapolation

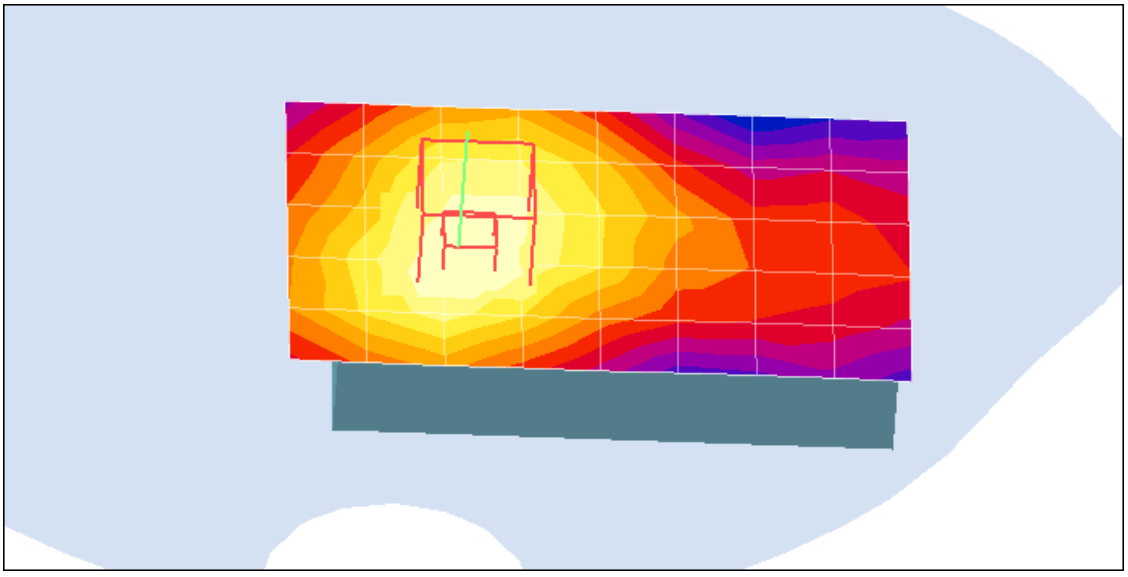


NHL-12, without MMC-card, without headset, Body 2.2 cm, E-GPRS1900/1-slot TX (Mid ch)
Date: 2004-04-29
Test Laboratory: TCC Salo

DUT: 07086; Serial: 004400/37/172947/4
Communication System: E-GPRS1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium: Body, f = 1880 MHz; σ = 1.58 mho/m; ε_r = 50.6; ρ = 1000 kg/m^3 ; t(liq.)=20.4°C
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1396; ConvF(4.79, 4.79, 4.79); Calibrated: 21.01.2004
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn372; Calibrated: 26.08.2003
- Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1179
- Measurement SW: DASY4, V4.2 Build 37; Postprocessing SW: SEMCAD, V1.8 Build 109

Body - Mid/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Body - Mid/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 6.46 V/m; Power Drift = -0.005 dB
Maximum value of SAR (measured) = 0.103 mW/g, Peak SAR (extrapolated) = 0.210 W/kg
SAR(1 g) = 0.096 mW/g; SAR(10 g) = 0.057 mW/g; Worst case extrapolation

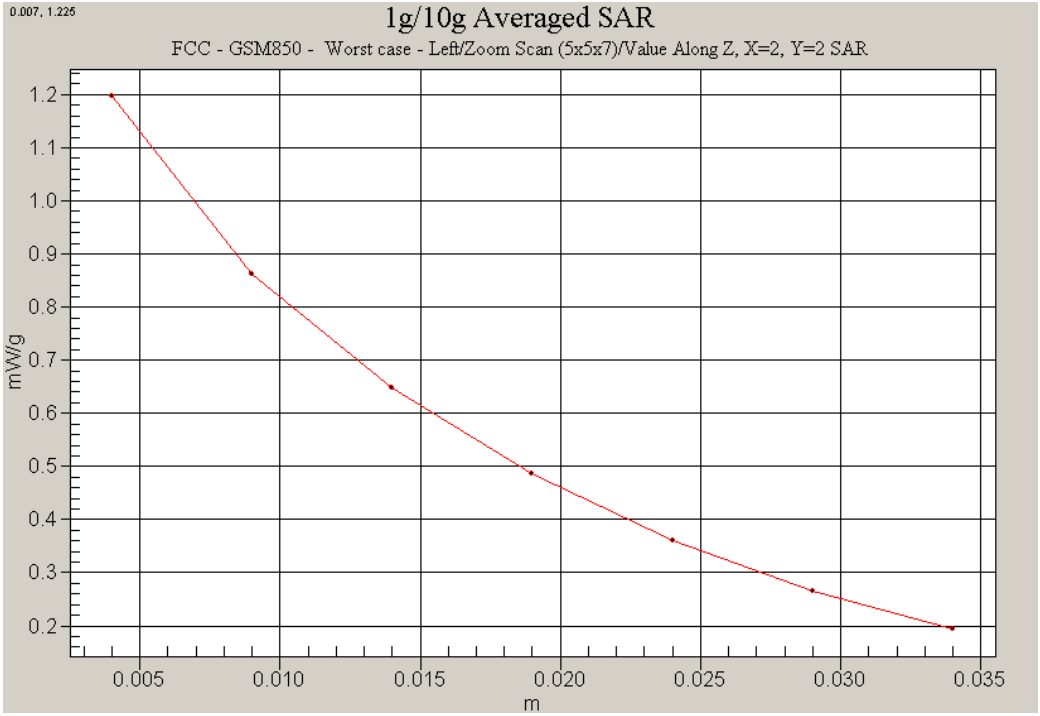


Z-Plot of

NHL-12, with MMC-card, BT active, Left Cheek, GSM 850 (High ch)
Date: 2004-04-28
Test Laboratory: TCC Salo

Medium: Head, f = 849 MHz; σ = 0.919 mho/m; ε_r = 41; ρ = 1000 kg/m^3 , t(liq.)=20.5°C

Cheek - High - WITH MMC - BT ACTIVE/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Cheek - High - WITH MMC - BT ACTIVE/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 27.6 V/m; Power Drift = 0.1 dB
Maximum value of SAR (measured) = 1.2 mW/g, Peak SAR (extrapolated) = 1.7 W/kg
SAR(1 g) = 1.16 mW/g; SAR(10 g) = 0.809 mW/g; Worst case extrapolation

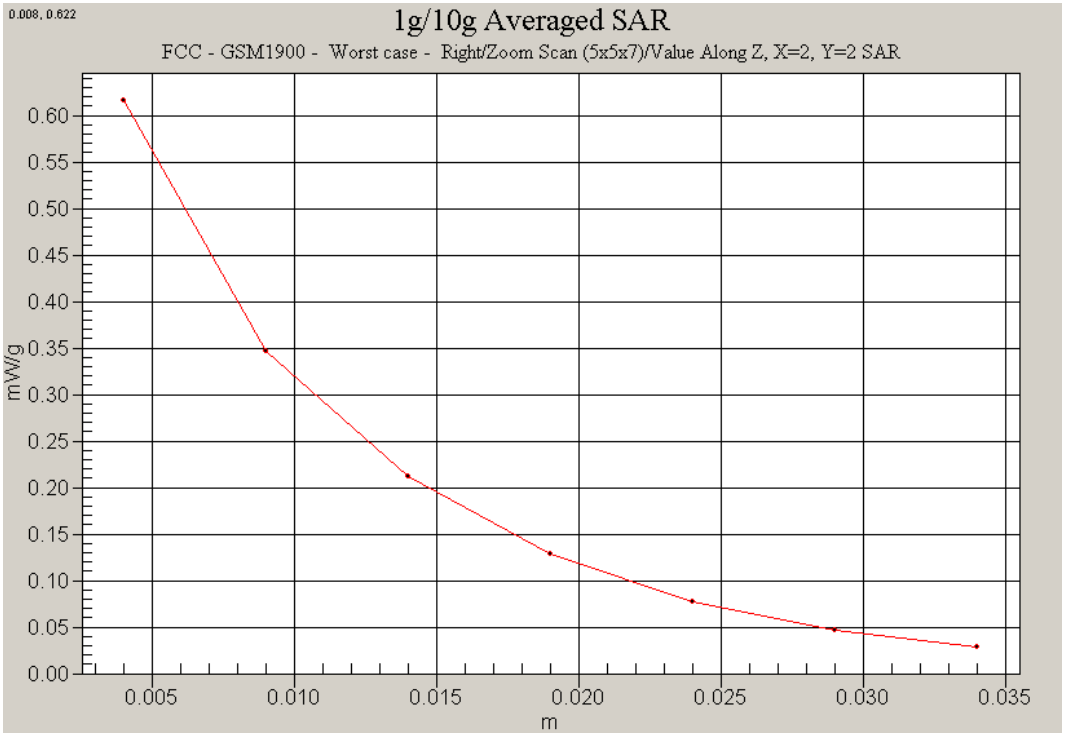


Z-Plot of

NHL-12, without MMC-card, BT active, Right Tilt, GSM 1900 (Mid ch)
Date: 2004-04-27
Test Laboratory: TCC Salo

Medium: Head, f = 1880 MHz; σ = 1.44 mho/m; ε_r = 38.1; ρ = 1000 kg/m^3 : t(liq)=20.8°C

Tilt - Middle WITH BT ACTIVE/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Tilt - Middle WITH BT ACTIVE/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 19.9 V/m; Power Drift = -0.1 dB
Maximum value of SAR (measured) = 0.617 mW/g, Peak SAR (extrapolated) = 1.17 W/kg
SAR(1 g) = 0.583 mW/g; SAR(10 g) = 0.325 mW/g; Worst case extrapolation

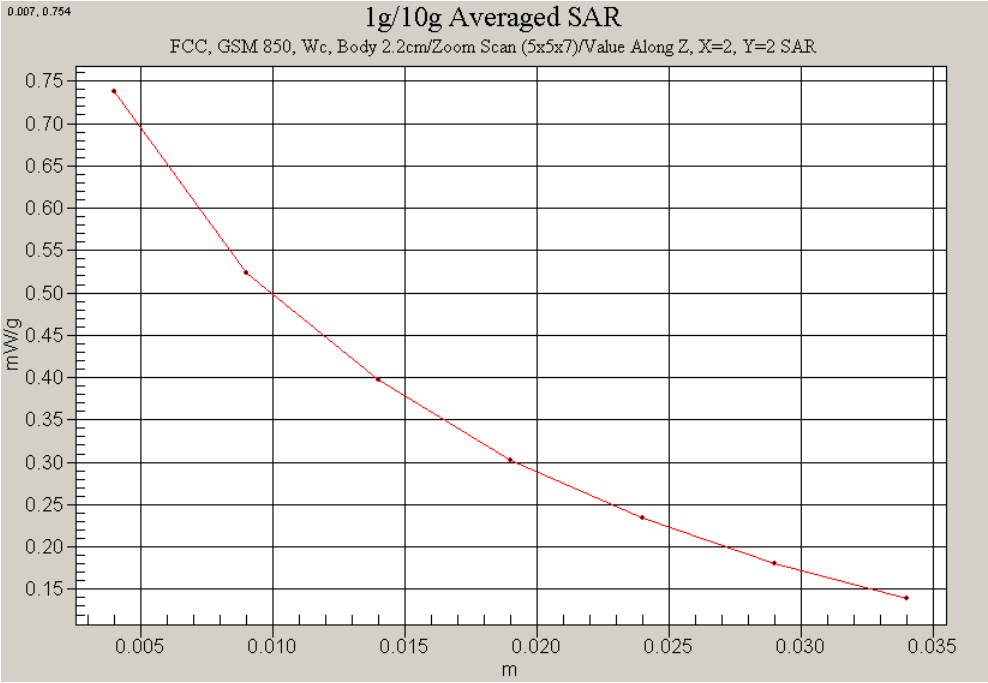


Z-Plot of

NHL-12, without MMC-card, without headset, Body 2.2 cm, GSM 850 (Low ch)
Date: 2004-04-29
Test Laboratory: TCC Salo

Medium: Body, f = 824 MHz; σ = 0.941 mho/m; ε_r = 54.4; ρ = 1000 kg/m^3 ; t(liq.)=20.8°C

Body-Low/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Body-Low/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 18 V/m; Power Drift = 0.0 dB
Maximum value of SAR (measured) = 0.738 mW/g, Peak SAR (extrapolated) = 1.03 W/kg
SAR(1 g) = 0.703 mW/g; SAR(10 g) = 0.505 mW/g; Worst case extrapolation

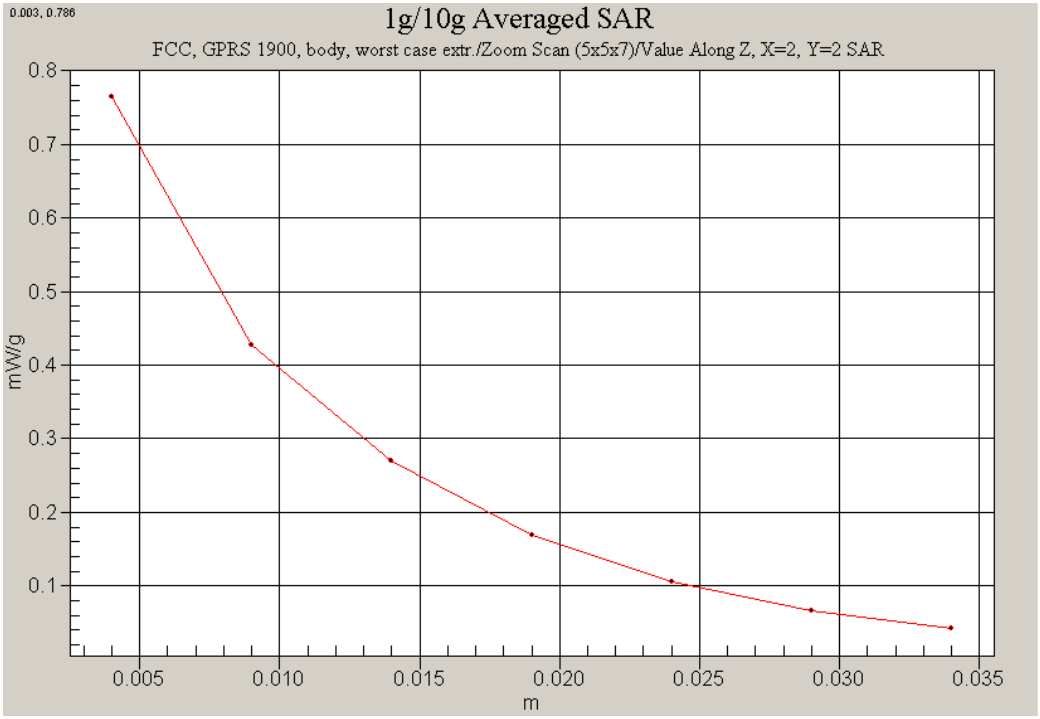


Z-Plot of

NHL-12, with MMC-card, without headset, Body 2.2 cm, GPRS1900/2-slot TX (Low ch)
Date: 2004-04-29
Test Laboratory: TCC Salo

Medium: Body, f = 1850.2 MHz; σ = 1.56 mho/m; ε_r = 50.8; ρ = 1000 kg/m^3 ; t(liq.)=20.5°C

Body - Low - WITH MMC/Area Scan (6x9x1): Measurement grid: dx=15mm, dy=15mm
Body - Low - WITH MMC/Zoom Scan (5x5x7) (5x5x7): Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 19 V/m; Power Drift = -0.0 dB
Maximum value of SAR (measured) = 0.766 mW/g, Peak SAR (extrapolated) = 1.48 W/kg
SAR(1 g) = 0.739 mW/g; SAR(10 g) = 0.440 mW/g; Worst case extrapolation



APPENDIX C: RELEVANT PAGES FROM PROBE CALIBRATION REPORT(S)

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

Client Nokia TCC Salo

CALIBRATION CERTIFICATE

Object(s)	ET3DV6 - SN:1396
Calibration procedure(s)	QA CAL-01.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	January 21, 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 < 70%.

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 252-0260)	Apr-04
Power sensor E4412A	MY41495277	2-Apr-03 (METAS, No 252-0260)	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	6-Sep-03 (Sintrel SCS No. E-030929)	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	US39421U01700	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:	Nico Vetterli	Technician	
Approved by:	Katja Pokovic	Laboratory Director	

Date issued: January 22, 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.

890-KP0301061-A Page 1 of 8

ET3DV6 SN:1396 January 21, 2004

DASY - Parameters of Probe: ET3DV6 SN:1396

Sensitivity in Free Space

Diode Compression[A]

NormX	1.76 μV/(V/m)^2	DCP X	93	mV
NormY	1.75 μV/(V/m)^2	DCP Y	93	mV
NormZ	1.88 μV/(V/m)^2	DCP Z	93	mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 7.

Boundary Effect

Head **900 MHz** **Typical SAR gradient: 5 % per mm**

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR_{be} [%]	Without Correction Algorithm	7.7	4.2
SAR_{be} [%]	With Correction Algorithm	0.1	0.2

Head **1800 MHz** **Typical SAR gradient: 10 % per mm**

Sensor to Surface Distance		3.7 mm	4.7 mm
SAR_{be} [%]	Without Correction Algorithm	12.3	8.8
SAR_{be} [%]	With Correction Algorithm	0.2	0.3

Sensor Offset

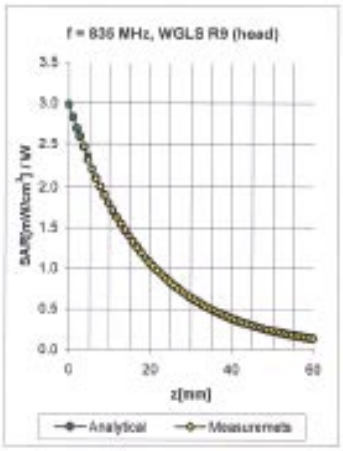
Probe Tip to Sensor Center	2.7 mm
Optical Surface Detection	in tolerance

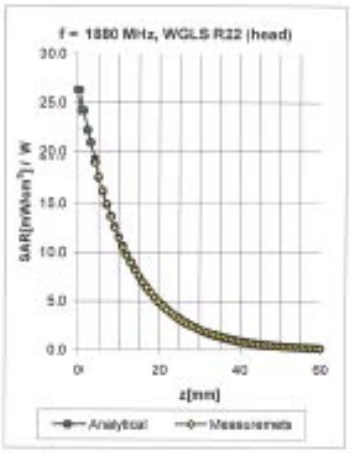
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] numerical linearization parameter: uncertainty not required

ET3DV6 SN:1396 January 21, 2004

Conversion Factor Assessment





f [MHz]	Validity [MHz]*	Tissue	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
835	750-950	Head	41.5 ± 5%	0.90 ± 5%	0.52	1.86	6.98 ± 11.9% (k=2)
1880	1800-2000	Head	40.0 ± 5%	1.40 ± 5%	0.49	2.09	5.37 ± 11.3% (k=2)
835	750-950	Body	55.2 ± 5%	0.97 ± 5%	0.44	2.09	6.80 ± 11.9% (k=2)
1880	1800-2000	Body	53.3 ± 5%	1.52 ± 5%	0.55	2.88	4.79 ± 11.3% (k=2)

* 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.

Page 7 of 8

APPENDIX D: RELEVANT PAGES FROM DIPOLE VALIDATION KIT REPORT(S)

835 MHz DIPOLE, HEAD CALIBRATION:

Schmid & Partner
Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 79

Calibration Certificate

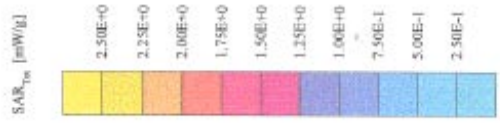
835 MHz System Validation Dipole

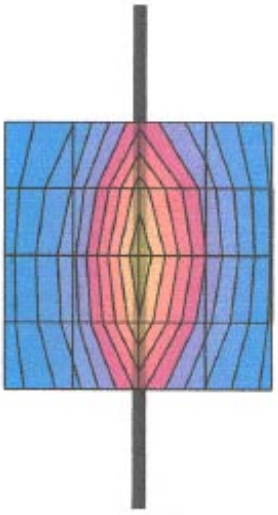
Type:	D835V2
Serial Number:	462
Place of Calibration:	Zurich
Date of Calibration:	July 1, 2002
Calibration Interval:	24 months

Schmid & Partner Engineering AG hereby certifies, that this device has been calibrated on the date indicated above. The calibration was performed in accordance with specifications and procedures of Schmid & Partner Engineering AG.

Wherever applicable, the standards used in the calibration process are traceable to international standards. In all other cases the standards of the Laboratory for EMF and Microwave Electronics at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland have been applied.

Calibrated by:	
Approved by:	

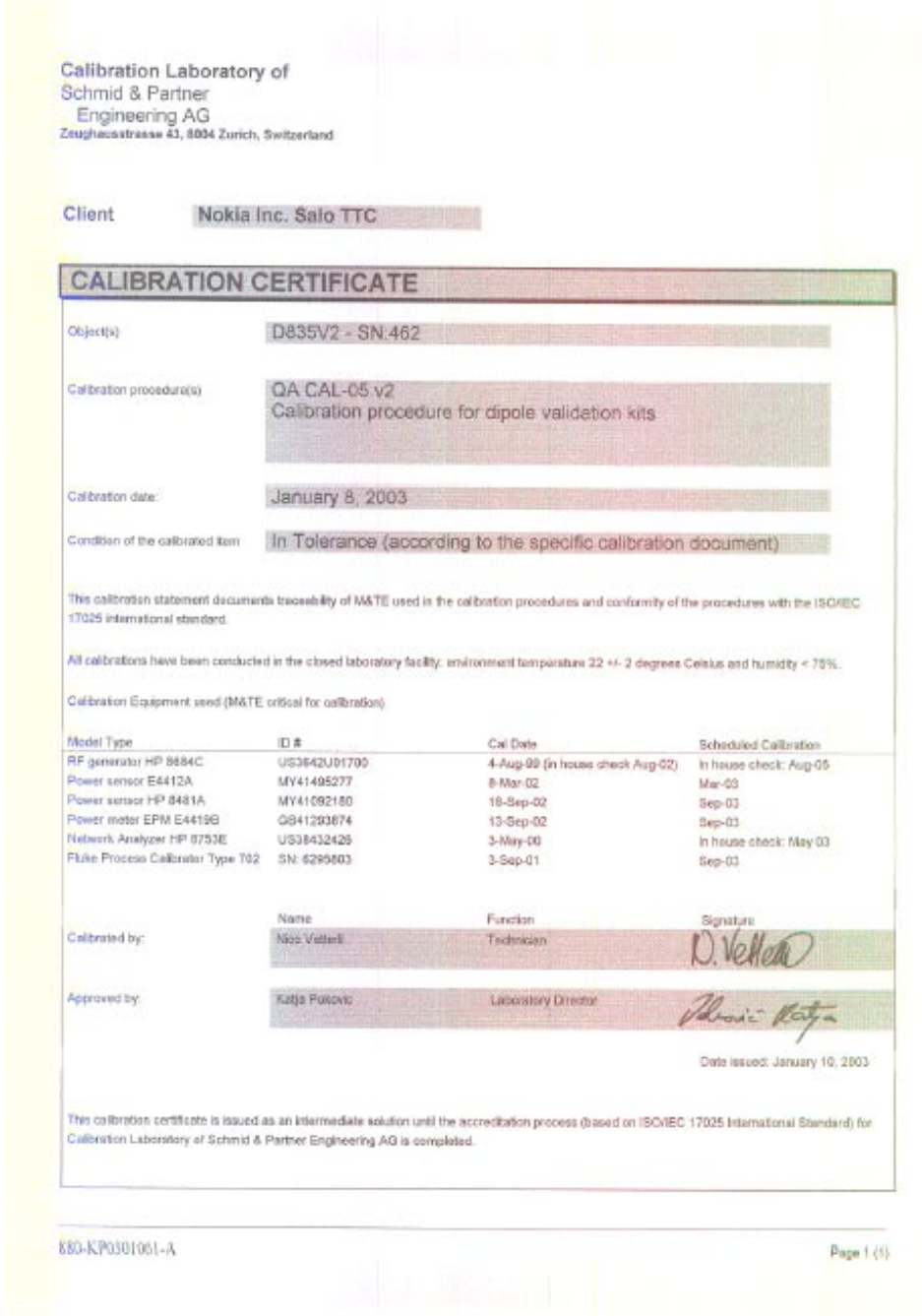




Validation Dipole D835V2 SN462, d = 15 mm
Frequency: 835 MHz; Antenna Input Power: 250 [mW]
SAM Phantom; Flat Section; Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(6.60,6.60,6.60) at 835 MHz; IEEE1528 835 MHz: σ = 0.90 mho/m ε_r = 42.5 ρ = 1.00 g/cm^3
Cubes (2): Peak: 3.82 mW/g ± 0.02 dB, SAR (1g): 2.45 mW/g ± 0.02 dB, SAR (10g): 1.58 mW/g ± 0.02 dB, (Worst-case extrapolation)
Penetration depth: 12.2 (11.2, 13.5) [mm]
Powerdrift: -0.09 dB

07/01/02

835 MHz DIPOLE, BODY CALIBRATION:



Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

Client Nokia Inc. Salo TTC

CALIBRATION CERTIFICATE

Object(s)	D835V2 - SN:462
Calibration procedure(s)	QA CAL-05.v2 Calibration procedure for dipole validation kits
Calibration date:	January 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 HP 8684C	US3642U01700	4-Aug-99 (in house check Aug-02)	In house check: Aug-05
Power sensor E4412A	MY41495277	8-Mar-02	Mar-03
Power sensor HP 8481A	MY41092180	18-Sep-02	Sep-03
Power meter EPM E4419B	GB41293874	13-Sep-02	Sep-03
Network Analyzer HP 8753E	US38432426	3-May-00	In house check: May 03
Fluke Process Calibrator Type 702	SN: 6295803	3-Sep-01	Sep-03

	Name	Function	Signature
Calibrated by:	Nico Vetterli	Technician	
Approved by:	Katja Pokovic	Laboratory Director	

Date issued: January 10, 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.

880-KP0301061-A Page 1 (1)

Date/Time: 01/08/03 14:26:58

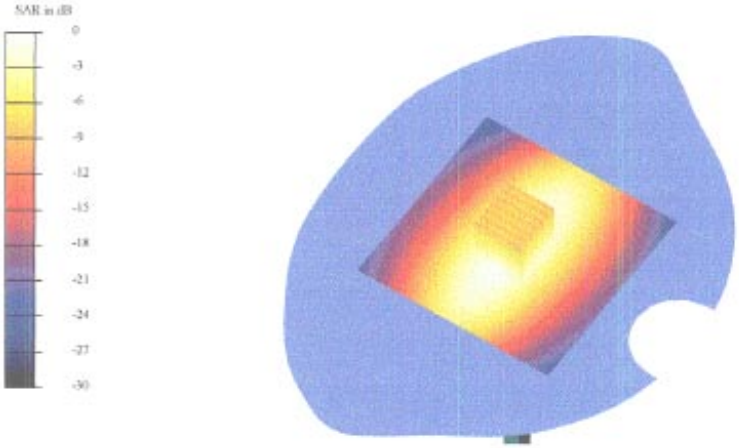
Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN462_SN1507_M835_080103.da4

DUT: Dipole 835 MHz Type & Serial Number: D835V2 - SN462
Program: Dipole Calibration; Pin = 250 mW; d = 15 mm

Communication System: CW-835; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: Muscle 835 MHz (σ = 0.96 mho/m, ε = 55.47, ρ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1507; ConvF(6.2, 6.2, 6.2); Calibrated: 1/24/2002
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN410; Calibrated: 7/18/2002
- Phantom: SAM 4.0 - TP:1006
- Software: DASY4, V4.0 Build 51

Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm
Reference Value = 56 V/m
Peak SAR = 3.45 mW/g
SAR(1 g) = 2.48 mW/g; SAR(10 g) = 1.63 mW/g
Power Drift = -0.003 dB



1900 MHz DIPOLE; HEAD CALIBRATION:

Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 79

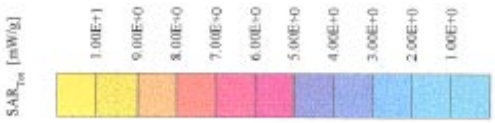
DASY3

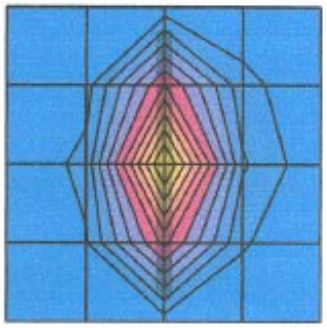
Dipole Validation Kit

Type: D1900V2

Serial: 5d013

Manufactured: April 30, 2002
Calibrated: July 1, 2002

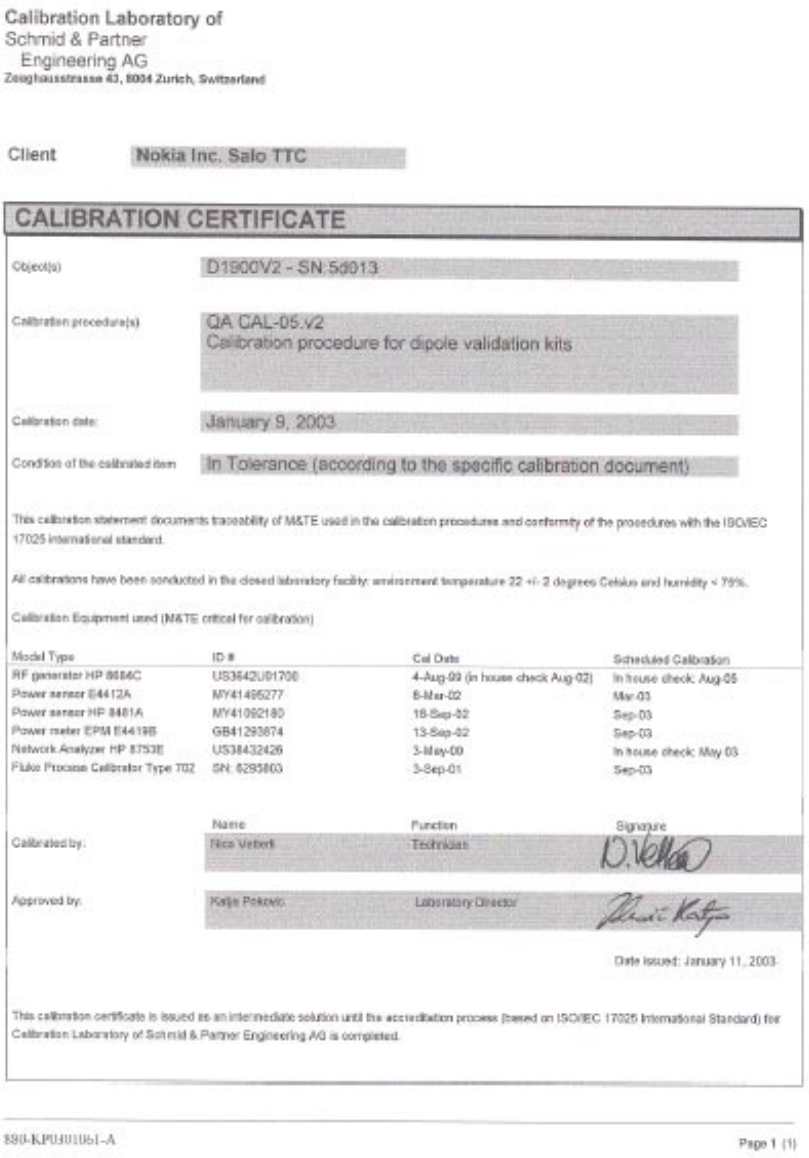




07/01/02

Validation Dipole D1900V2 SN5d013, d = 10 mm
Frequency: 1900 MHz; Antenna Input Power: 250 [mW]
SAM Phantom; Flat Section; Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(5.20,5.20,5.20) at 1900 MHz; IEEE1528 1900 MHz: σ = 1.46 mho/m ε_r = 39.8 ρ = 1.00 g/cm^3
Cubes (2): Peak: 20.5 mW/g ± 0.63 dB, SAR (1g): 11.6 mW/g ± 0.02 dB, SAR (10g): 5.70 mW/g ± 0.01 dB, (Worst-case extrapolation)
Penetration depth: 8.1 (7.8, 8.9) [mm]
Powerdrift: 0.02 dB

1900 MHz DIPOLE, BODY CALIBRATION:



Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

Client Nokia Inc. Salo TTC

CALIBRATION CERTIFICATE

Object(s)	D1900V2 - SN:5d013
Calibration procedure(s)	QA CAL-05.v2 Calibration procedure for dipole validation kits
Calibration date:	January 9, 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 HP 8684C	US3642U01700	4-Aug-99 (in house check Aug-02)	In house check: Aug-05
Power sensor E4412A	MY41495277	6-Mar-02	Mar-03
Power sensor HP 8481A	MY41092180	18-Sep-02	Sep-03
Power meter EPM E4419B	GB41293874	13-Sep-02	Sep-03
Network Analyzer HP 8753E	US38432426	3-May-00	In house check: May 03
Fluke Process Calibrator Type 702	SN: 6295803	3-Sep-01	Sep-03

	Name	Function	Signature
Calibrated by:	Nico Verbeek	Technician	
Approved by:	Katja Pokovic	Laboratory Director	

Date issued: January 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.

SSI-KPU01061-A Page 1 (1)

Date/Time: 01/09/03 17:04:5

Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN5d013_SN1507_M1900_090103.da4

DUT: Dipole 1900 MHz Type & Serial Number: D1900V2 - SN5d013
Program: Dipole Calibration; Pin = 250 mW; d = 10 mm

Communication System: CW-1900; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: Muscle 1900 MHz (σ = 1.57 mho/m, ε = 50.97, ρ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1507; ConvF(4.9, 4.9, 4.9); Calibrated: 1/24/2002
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 - SN410; Calibrated: 7/18/2002
- Phantom: SAM 4.0 - TP:1006
- Software: DASY4, V4.0 Build 51

Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm
Reference Value = 91.7 V/m
Peak SAR = 19.4 mW/g
SAR(1 g) = 10.6 mW/g; SAR(10 g) = 5.44 mW/g
Power Drift = -0.003 dB