TCC
Nokia

FINAS
Finnish Accreditation Service
T117 (EN ISO/IEC 17025)

SAR Compliance Test Report

Test report no.:	FCC_RM-900_03	**Date of report:**	2013-01-16
Template version:	19.3	**Number of pages:**	57
Testing laboratory:	TCC Nokia Beijing Laboratory Beijing Economic and Technological Development Area No.5 Donghuan Zhonglu Beijing PRC China 100176 Tel. +86 10 8711 8888 Fax. +86 10 8711 4550	**Client:**	Nokia Corporation Beijing Economic and Technological Development Area No.5 Donghuan Zhonglu Beijing PRC China 100176 Tel. +86 10 8711 8888 Fax. +86 10 8711 4550
Responsible test engineer:	Liang Dong	**Product contact person:**	Zhang David
Measurements made by:	Liu Xianchao, Zhang Luwen		
Tested device:	RM-900		
FCC ID:	QTLRM-900	**IC:**	661AB-RM900
Supplement reports:	SAR_Photo_RM-900_04		
Testing has been carried out in accordance with:	**47CFR §2.1093** Radiofrequency Radiation Exposure Evaluation: Portable Devices **FCC OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01)** Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields **RSS-102** Evaluation Procedure for Mobile and Portable Radio Transmitters with Respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields **IEEE 1528 - 2003** IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Technique		
Documentation:	The documentation of the testing performed on the tested devices is archived for 15 years at TCC Nokia.		
Test results:	**The tested device complies with the requirements in respect of all parameters subject to the test.** The test results and statements relate only to the items tested. The test report shall not be reproduced except in full, without written approval of the laboratory.		

Date and signatures:

For the contents:

Liang Dong

Digitally signed by Liang Dong
DN: cn=Liang Dong, o=Device Compliance, ou=Mobile Solution, email=dong.liang@nokia.com, c=CN
Date: 2013.01.21 10:05:50 +08'00'

CONTENTS

1. SUMMARY OF SAR TEST REPORT

1.1 Test Details

Period of test	2013-01-10 to 2013-01-15
SN, HW and SW numbers of tested device	SN: 004402/47/128598/5, HW: 0204, SW: aqs12w49, DUT: 52906 SN: 004402/47/128607/4, HW: 0204, SW: aqs12w49, DUT: 52907
Batteries used in testing	BL-4U, DUT: 52901, 52900
Headsets used in testing	WH-108, DUT: 52918, 52919
Other accessories used in testing	-
State of sample	Prototype unit
Notes	-

1.2 Maximum Results

The maximum measured SAR values for Head configuration and Body Worn configuration are given in section 1.2.1 and 1.2.2 respectively. The device conforms to the requirements of the standard(s) when the maximum reported 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)	Reported* SAR value (1g avg)	SAR limit (1g avg)	Result	Plot#
GSM850	251 / 848.8	32.89 dBm	Left, Cheek	0.602 W/kg	**0.68 W/kg**	1.6 W/kg	PASSED	1
4-slot GPRS1900	661 / 1880.0	25.52 dBm	Right, Cheek	0.891 W/kg	**1.00 W/kg**	1.6 W/kg	PASSED	2
WLAN2450	11 / 2462.0	16.30 dBm	Left, Cheek	0.227 W/kg	**0.27 W/kg**	1.6 W/kg	PASSED	3
GSM850 + WLAN2450	-	-	Left, Cheek	0.628 W/kg	**0.70 W/kg**	1.6 W/kg	PASSED	4
4-slot GPRS1900 + WLAN2450	-	-	Right, Cheek	0.891 W/kg	**1.00 W/kg**	1.6 W/kg	PASSED	2

1.2.2 Body Worn Configuration

Mode	Ch / *f* (MHz)	Conducted power	Separation distance	Measured SAR value (1g avg)	Reported* SAR value (1g avg)	SAR limit (1g avg)	Result	Plot#
GSM850	128 / 824.2	32.98 dBm	1.5cm	0.522 W/kg	**0.59 W/kg**	1.6 W/kg	PASSED	6
4-slot GPRS1900	661 / 1880.0	25.52 dBm	1.5cm	0.339 W/kg	**0.38 W/kg**	1.6 W/kg	PASSED	7
WLAN2450	11 / 2462.0	16.30 dBm	1.5cm	0.092 W/kg	**0.12 W/kg**	1.6 W/kg	PASSED	8
GSM850 + WLAN2450	-	-	1.5cm	0.543 W/kg	**0.62 W/kg**	1.6 W/kg	PASSED	9
4-slot GPRS1900 + WLAN2450	-	-	1.5cm	0.355 W/kg	**0.40 W/kg**	1.6 W/kg	PASSED	10

* Reported SAR values are scaled to, or measured at, upper limit of power tuning tolerance. In addition, SAR values are scaled up by 12% to cover measurement drift. As a consequence of this upward drift correction, the contribution of measurement drift to the overall measurement uncertainty (Section 6) is reduced to zero.

1.2.3 Summary SAR data

	FCC-defined SAR values for the Grants of Equipment Authorization		
	PCE	**DTS**	**NII**
Maximum Head SAR values	1.00W/kg	0.27W/kg	-
{Max + Max} Simultaneous Head SAR value	1.14W/kg		
Maximum Body SAR values	0.59W/kg	0.12W/kg	-
{Max + Max} Simultaneous Body SAR value	0.70W/kg		
Maximum Product Specific (Wireless Router) SAR values	-	-	-
Maximum Simultaneous SAR value head SAR: 4-slot GPRS1900 + WLAN2450	1.14		

Note:

PCE contains the highest results between all cellular modes (cellular, AWS and PCS bands)
DTS contains the highest results between WLAN 2.4GHz + RLAN 5725-5850MHz
NII contains the highest results between RLAN 5150-5250, 5250-5350 and 5470-5725

1.2.4 Maximum Drift

Maximum drift covered by 12% scaling up of the SAR values	Maximum drift during measurements
0.5dB	0.48dB

1.2.5 Measurement Uncertainty

Expanded Uncertainty (k=2) 95%	± 26.4%

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)	Power Tuning Target (dBm)				Upper Limit of Power Tuning Tolerance (dBm)			
					1-slot	2-slot	3-slot	4-slot	1-slot	2-slot	3-slot	4-slot
GSM / GPRS	850	GMSK	1/8 to 4/8	824 – 849	32.50	29.50	27.70	26.50	32.85	29.85	28.05	26.85
	1900			1850 – 1910	30.50	27.50	25.70	24.50	30.85	27.85	26.05	24.85
BT	2450	GFSK	1	2402 – 2480	6.00				7.50			

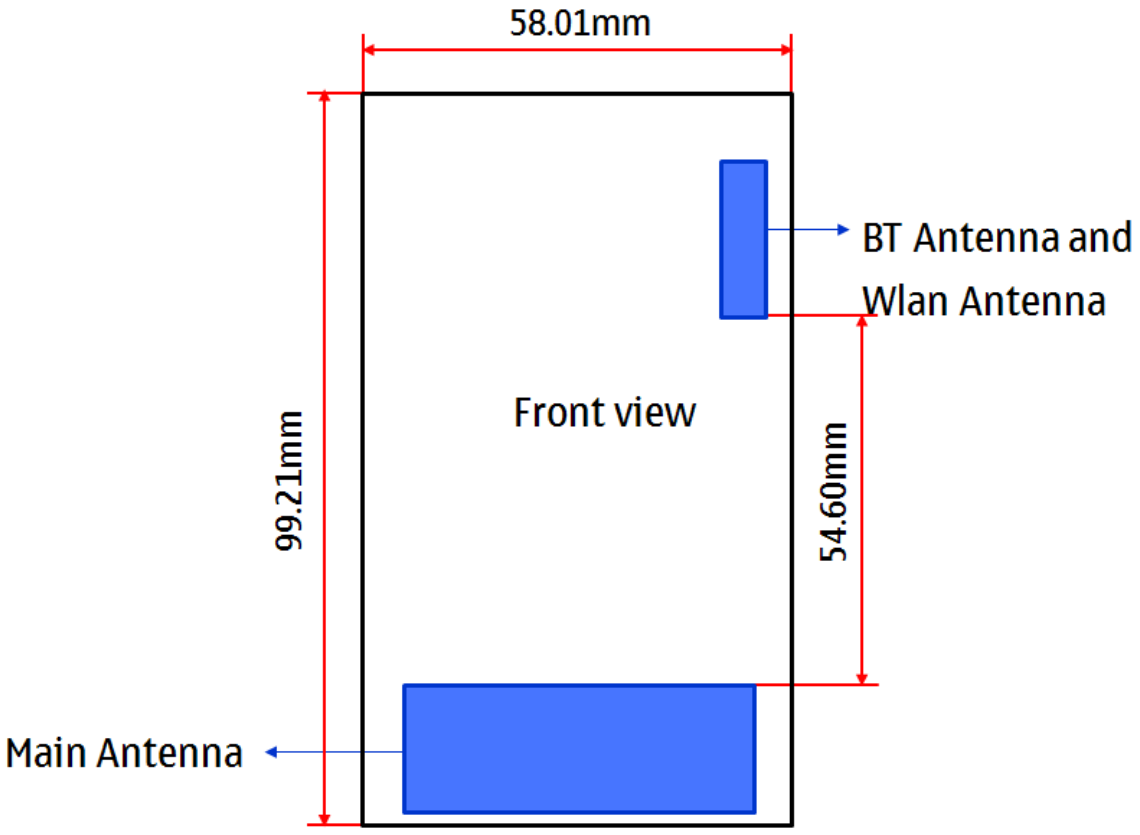
Modes of Operation	Bands	Modulation Mode	Duty Cycle	Transmitter Frequency Range (MHz)	Power Tuning Target (dBm)			Upper Limit of Power Tuning Tolerance (dBm)		
					Ch 1	Ch 6	Ch 11	Ch 1	Ch 6	Ch 11
WLAN b-mode	2450	Up to 11Mbps QPSK	1	2412 – 2472	15.00	15.00	15.00	16.50	16.50	16.50
WLAN g-mode	2450	Up to 54Mbps 64QAM	1	2412 – 2472	11.00	13.00	12.50	12.50	14.50	14.00
WLAN n-mode 20MHz	2450	Up to 72.2Mbps 64QAM	1	2412 – 2472	11.00	12.00	11.50	12.50	13.50	13.00

This is a BT Class 1 device; as its power tuning target plus tolerance is 7.5dBm (5.62mW), SAR testing was deemed unnecessary since (5.62mW/5mm)*√2.48GHz < 3.0 (KDB447498 D01 General RF Exposure Guidelines v05 Section 4.3.1 Standalone SAR test exclusion considerations)

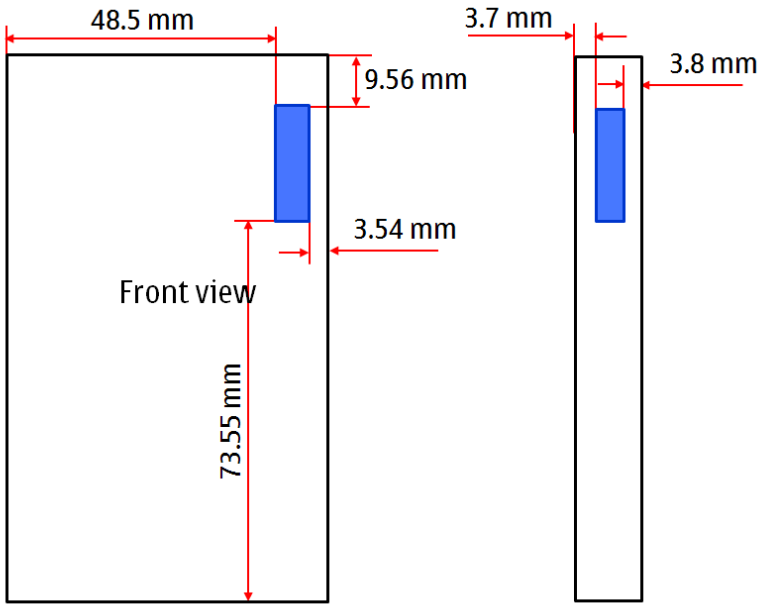
2.1 Description of the Antenna

The device has an internal antenna for cellular use. The cellular antenna is located at the bottom underneath the back cover.

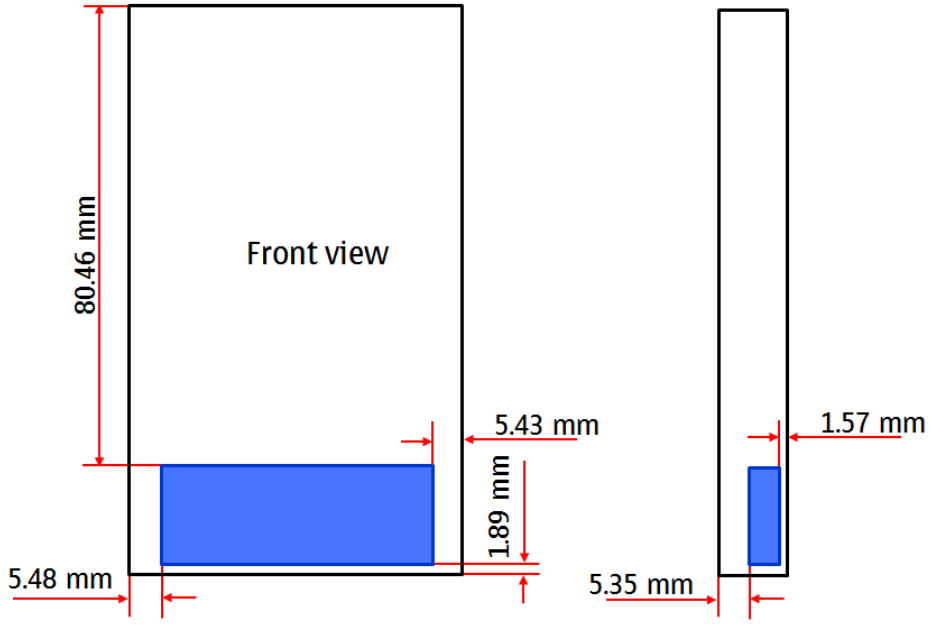
Phone Dimension and Distance Between Main antenna and BT Antenna



Distances between Outside surfaces of Device and BT, WLAN Antenna



Distances between Outside surfaces of Device and Main Antenna



3. TEST CONDITIONS

3.1 Temperature and Humidity

Ambient temperature (°C):	21.5 – 22.5
Ambient humidity (RH %):	35 - 55

3.2 Test Signal, Frequencies and Output Power

This device was tested in all the available multi-slot GMSK GPRS modes.

The device was put into operation by using a call tester except for testing WLAN2450 where control software was used. 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.

The maximum power levels in tested samples were set to upper limit of production tuning tolerance. Tuning targets and conducted power results are presented in Appendix F.

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

The radiated output power of the device was measured by a separate test laboratory on the same unit(s) as used for SAR testing. The results are given in the EMC report supporting this application.

The transmission mode of the device in all WLAN b-mode tests was DSSS QPSK 1Mbps. This mode is the default test mode used in Nokia's WLAN SAR testing. Ch 6 was measured also with data rate 11Mbs, as its conducted power on this higher data rate is more than 0.25dB higher than on 1MBs data rate.

The conducted output power of the device was measured by a separate test laboratory on the same units as used for SAR testing. The results are given in Appendix F of this report.

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 DASY near-field scanning system 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 date	Calibration expiry
DAE 4	1324	2012-02	2013-02
DAE 4	480	2012-10	2013-10
DAE 4	860	2012-10	2013-10
E-field Probe EX3DV4	3838	2012-02	2013-02
E-field Probe EX3DV4	3574	2012-10	2013-10
E-field Probe EX3DV4	3839	2012-10	2013-10
Dipole Validation Kit, D835V2	4d005	2012-03	2014-03
Dipole Validation Kit, D835V2	479	2011-03	2013-03
Dipole Validation Kit, D1900V2	547	2011-10	2013-10
Dipole Validation Kit, D2450V2	883	2012-02	2014-02
Dipole Validation Kit, D2450V2	760	2011-03	2013-03
DASY4 software	Version 4.7	-	-

Additional test equipment used in testing:

Test Equipment	Model	Serial Number	Calibration date	Calibration expiry
Signal Generator	E4432B	US40052231	2012-04	2013-04
Signal Generator	SME06	829445	2012-04	2013-04
Call Tester	CMU200	835352/008	-	-
Call Tester	CMU200	110735	-	-
Amplifier	AR 5SIG4M3	302339	-	-
Amplifier	AR 5S1G4M1	306024	-	-
RF Network Analyzer	8753ES	My40002096	2012-04	2013-04
RF Network Analyzer	8753ES	US39170317	2012-04	2013-04
Dielectric Probe Kit	85070C	2577	-	-
Dielectric Probe Kit	85070C	653	-	-
Power Meter	Agilent E4419B	My41291520	2012-04	2013-04
Power Sensor	Agilent 8482A	US37295411	2012-04	2013-04
Power Meter	R&S NRP	101293	2012-04	2013-04
Power Sensor	R&S NRP-Z51	102842	2012-04	2013-04

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 D
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 µW/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 Head SAR 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.

The phantom used for all Body SAR tests i.e. for both system checks and device testing, was a “Triple Flat Phantom” manufactured by SPEAG; this phantom conform to the requirements of OET Bulletin 65, Supplement C.

System checking for Head SAR testing was performed using the flat section, whilst Head SAR tests used the left and right head profile sections. System checking for Body SAR testing was performed using the Triple Flat Phantom.

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

800MHz band

Ingredient	Head (% by weight)	Body (% by weight)
Deionised Water	39.74	55.97
HEC	0.25	1.21
Sugar	58.31	41.76
Preservative	0.15	0.27
Salt	1.55	0.79

1900MHz band

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

2450MHz band

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

4.4 System validation and System checking

4.4.1 System validation status

Probe Calibration Point f / MHz	Test System	DASY SW	Dipole Type / SN	Probe Type / SN	DAE unit Type / SN	Validation done	
						Head tissue simulant	Body tissue simulant
835	TCC Beijing / SAR-1	V4.7	D835V2 / 479	EX3DV4 / 3839	DAE4 / 860	2012-11	2012-11
1900	TCC Beijing / SAR-1	V4.7	D1900V2 / 547	EX3DV4 / 3839	DAE4 / 860	2012-11	2012-11
2450	TCC Beijing / SAR-1	V4.7	D2450V2 / 760	EX3DV4 / 3574	DAE4 / 480	-	2012-11
835	TCC Beijing / SAR-3	V4.7	D835V2 / 4d005	EX3DV4 / 3838	DAE4 / 1324	2012-04	-
2450	TCC Beijing / SAR-3	V4.7	D2450V2 / 883	EX3DV4 / 3574	DAE4 / 480	2012-12	-

4.4.2 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		SAR 1g Deviation from target	Dielectric Parameters Deviation from target		Temp
			ε_r	σ [S/m]	dSAR [%]	$d\varepsilon_r$ [%]	$d\sigma$ [%]	[°C]
	Deviation of tolerances				±10 %	±5 %	±5 %	
	Reference result	2.32	41.5	0.89				
	IEEE1528 / IEC62209 Standard targets		41.5	0.90				
835	2013-01-10	2.35	41.1	0.89	1.29	-1.20	0.00	22.3
	Reference result	10.4	39.5	1.43				
	IEEE1528 / IEC62209 Standard targets		40.0	1.40				
1900	2013-01-11	10.2	39.7	1.46	-1.92	0.51	2.10	22.0
	Reference result	13.8	38.9	1.86				
	IEEE1528 / IEC62209 Standard targets		39.2	1.79				
2450	2013-01-11	13.2	38.8	1.84	-4.35	-0.26	-1.08	21.1

System checking, body tissue simulant

f [MHz]	Description	SAR [W/kg], 1g	Dielectric Parameters		SAR 1g Deviation from target	Dielectric Parameters Deviation from target		Temp
			ε_r	1g	dSAR [%]	$d\varepsilon_r$ [%]	$d\sigma$ [%]	[°C]
	Deviation of tolerances				±10 %	±5 %	±5 %	
	Reference result	2.52	54.3	0.99				
	FCC Supplement C Standard targets		55.2	0.97				
835	2013-01-15	2.46	54.7	0.96	-2.38	0.74	-3.03	22.0
	Reference result	10.6	54.2	1.59				
	FCC Supplement C Standard targets		53.3	1.52				
1900	2013-01-15	10.4	52.4	1.54	-1.89	-3.32	-3.14	22.0
	Reference result	13.3	51.7	1.93				
	FCC Supplement C Standard targets		52.7	1.94				
2450	2013-01-10	12.9	50.6	1.88	-3.01	-2.13	-2.59	21.8

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

4.5 Tissue Simulants used in the Measurements

Head tissue simulant measurements

f [MHz]	Description	Dielectric Parameters		Dielectric Parameters Deviation from Standard target		Temp [°C]
		ε_r	σ [S/m]	$d\varepsilon_r$ [%]	$d\sigma$ [%]	
	Deviation of tolerances			±5 %	±5 %	
	Recommended value	41.5	0.90			
836	2013-01-10	41.0	0.89	-1.20	-1.11	22.3
	Recommended value	40.0	1.40			
1880	2013-01-11	39.8	1.44	-0.50	2.86	22.0
	Recommended value	39.2	1.79			
2437	2013-01-11	38.9	1.83	-0.77	2.23	21.1

Body tissue simulant measurements

f [MHz]	Description	Dielectric Parameters		Dielectric Parameters Deviation from Standard target		Temp [°C]
		ε_r	σ [S/m]	$d\varepsilon_r$ [%]	$d\sigma$ [%]	
	Deviation of tolerances			±5 %	±5 %	
	Recommended value	55.2	0.97			
836	2013-01-15	54.7	0.96	-0.91	-1.03	22.0
	Recommended value	53.3	1.52			
1880	2013-01-15	52.5	1.53	-1.50	0.66	22.0
	Recommended value	52.7	1.94			
2437	2013-01-10	50.6	1.87	-3.98	-3.61	21.8

Dielectric parameter data for the band edges is given in Appendix C.

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 both sides facing the phantom to find the highest results.

Nokia body-worn accessories are commonly available for the separation distance used in this testing.

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	$c_i . u_i$ (%)	v_i
Measurement System							
Probe Calibration	E2.1	±6.55	N	1	1	±6.55	∞
Axial Isotropy	E2.2	±4.7	R	√3	$(1-c_p)^{1/2}$	±1.9	∞
Hemispherical Isotropy	E2.2	±9.6	R	√3	$(c_p)^{1/2}$	±3.9	∞
Boundary Effect	E2.3	±1.0	R	√3	1	±0.6	∞
Linearity	E2.4	±4.7	R	√3	1	±2.7	∞
System Detection Limits	E2.5	±1.0	R	√3	1	±0.6	∞
Readout Electronics	E2.6	±1.0	N	1	1	±1.0	∞
Response Time	E2.7	±0.8	R	√3	1	±0.5	∞
Integration Time	E2.8	±2.6	R	√3	1	±1.5	∞
RF Ambient Conditions - Noise	E6.1	±3.0	R	√3	1	±1.7	∞
RF Ambient Conditions - Reflections	E6.1	±3.0	R	√3	1	±1.7	∞
Probe Positioner Mechanical Tolerance	E6.2	±0.4	R	√3	1	±0.2	∞
Probe Positioning with respect to Phantom Shell	E6.3	±2.9	R	√3	1	±1.7	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	E5	±3.9	R	√3	1	±2.3	∞
Test sample Related							
Test Sample Positioning	E4.2	±6.0	N	1	1	±6.0	11
Device Holder Uncertainty	E4.1	±5.0	N	1	1	±5.0	7
Output Power Variation - SAR drift measurement	6.6.3	±0.0	R	√3	1	±0.0	∞
Phantom and Tissue Parameters							
Phantom Uncertainty (shape and thickness tolerances)	E3.1	±4.0	R	√3	1	±2.3	∞
Conductivity Target - tolerance	E3.2	±5.0	R	√3	0.64	±1.8	∞
Conductivity - measurement uncertainty	E3.3	±5.5	N	1	0.64	±3.5	5
Permittivity Target - tolerance	E3.2	±5.0	R	√3	0.6	±1.7	∞
Permittivity - measurement uncertainty	E3.3	±2.9	N	1	0.6	±1.7	5
Combined Standard Uncertainty			RSS			**±13.2**	116
Coverage Factor for 95%			**k=2**				
Expanded Uncertainty						**±26.4**	

7. RESULTS

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

850MHz Head SAR results

Mode	Device orientation	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Plot #
		Ch 128	Ch 190	Ch 251	Ch 128	Ch 190	Ch 251	
		824.2 MHz	836.6 MHz	848.8 MHz	824.2 MHz	836.6 MHz	848.8 MHz	
GSM	Tuning Target + Tolerance [dBm]	32.85			Scaling factor*			
	Conducted Slot Average Power [dBm]	32.98	32.90	32.89	0.50	0.50	0.50	dB
	Time-averaged power [dBm]	23.95	23.87	23.86	1.12	1.12	1.12	Lin
	Left Cheek	0.583	0.584	**0.602**	0.654	0.655	**0.675**	1
	Left Tilt	-	0.245	-	-	0.275	-	-
	Right Cheek	-	0.528	-	-	0.592	-	-
	Right Tilt	-	0.253	-	-	0.284	-	-
2-slot GPRS	Tuning Target + Tolerance [dBm]	29.85			Scaling factor*			
	Conducted Slot Average Power [dBm]	29.98	29.93	29.90	0.50	0.50	0.50	dB
	Time-averaged power [dBm]	23.96	23.91	23.88	1.12	1.12	1.12	Lin
	Left Cheek	-	0.549	-	-	0.616	-	-
	Left Tilt	-	-	-	-	-	-	-
	Right Cheek	-	-	-	-	-	-	-
	Right Tilt	-	-	-	-	-	-	-

(Table continues)

(Table continues)

3-slot GPRS	**Tuning Target + Tolerance [dBm]**	**28.05**			**Scaling factor***			
	Conducted Slot Average Power [dBm]	**28.19**	**28.14**	**28.11**	**0.50**	**0.50**	**0.50**	**dB**
	Time-averaged power [dBm]	**23.93**	**23.88**	**23.85**	**1.12**	**1.12**	**1.12**	**Lin**
	Left Cheek	-	0.536	-	-	0.601	-	-
	Left Tilt	-	-	-	-	-	-	-
	Right Cheek	-	-	-	-	-	-	-
	Right Tilt	-	-	-	-	-	-	-
4-slot GPRS	**Tuning Target + Tolerance [dBm]**	**26.85**			**Scaling factor***			
	Conducted Slot Average Power [dBm]	**26.98**	**26.97**	**26.97**	**0.50**	**0.50**	**0.50**	**dB**
	Time-averaged power [dBm]	**23.97**	**23.96**	**23.96**	**1.12**	**1.12**	**1.12**	**Lin**
	Left Cheek	-	0.535	-	-	0.600	-	-
	Left Tilt	-	-	-	-	-	-	-
	Right Cheek	-	-	-	-	-	-	-
	Right Tilt	-	-	-	-	-	-	-

1900MHz Head SAR results

Mode	Device orientation	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Plot #
		Ch 512	Ch 661	Ch 810	Ch 512	Ch 661	Ch 810	
		1850.2 MHz	1880.0 MHz	1909.8 MHz	1850.2 MHz	1880.0 MHz	1909.8 MHz	
GSM	Tuning Target + Tolerance [dBm]	30.85			Scaling factor*			
	Conducted Slot Average Power [dBm]	31.15	31.11	31.04	0.50	0.50	0.50	dB
	Time-averaged power [dBm]	22.12	22.08	22.01	1.12	1.12	1.12	Lin
	Left Cheek	-	0.563	-	-	0.632	-	-
	Left Tilt	-	-	-	-	-	-	-
	Right Cheek	-	-	-	-	-	-	-
	Right Tilt	-	-	-	-	-	-	-
2-slot GPRS	Tuning Target + Tolerance [dBm]	27.85			Scaling factor*			
	Conducted Slot Average Power [dBm]	28.11	28.16	28.2	0.50	0.50	0.50	dB
	Time-averaged power [dBm]	22.09	22.14	22.18	1.12	1.12	1.12	Lin
	Left Cheek	-	0.602		-	0.675	-	-
	Left Tilt	-	-	-	-	-	-	-
	Right Cheek	-	-	-	-	-	-	-
	Right Tilt	-	-	-	-	-	-	-
3-slot GPRS	Tuning Target + Tolerance [dBm]	26.05			Scaling factor*			
	Conducted Slot Average Power [dBm]	26.43	26.55	26.57	0.50	0.50	0.50	dB
	Time-averaged power [dBm]	22.17	22.29	22.31	1.12	1.12	1.12	Lin
	Left Cheek	-	0.637	-	-	0.715	-	-
	Left Tilt	-	-	-	-	-	-	-
	Right Cheek	-	-	-	-	-	-	-
	Right Tilt	-	-	-	-	-	-	-

(Table continues)

(Table continues)

4-slot GPRS	Tuning Target + Tolerance [dBm]	24.85			Scaling factor*			
	Conducted Slot Average Power [dBm]	25.37	25.52	25.47	0.50	0.50	0.50	dB
	Time-averaged power [dBm]	22.36	22.51	22.46	1.12	1.12	1.12	Lin
	Left Cheek	-	0.648	-	-	0.727	-	-
	Left Tilt		0.226	-	-	0.254	-	-
	Right Cheek	0.657	**0.891**	0.878	0.737	**1.00**	0.985	2
	Right Tilt	-	0.198	-	-	0.222	-	-
4-slot GPRS	Repeated SAR: Right Cheek	-	0.884	-	-	0.990	-	-

2450MHz Head SAR results

Mode	Device orientation	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Plot #
		Ch 1	Ch 6	Ch 11	Ch 1	Ch 6	Ch 11	
		2412.0 MHz	2437.0 MHz	2462.0 MHz	2412.0 MHz	2437.0 MHz	2462.0 MHz	
WLAN b-mode 1Mbps	Tuning Target + Tolerance [dBm]	16.50			Scaling factor*			
	Conducted Power [dBm]	16.27	15.64	16.30	0.73	1.36	0.70	dB
	Time-averaged power [dBm]	16.27	15.64	16.30	1.18	1.37	1.17	Lin
	Left Cheek	0.158	0.191	**0.227**	0.187	0.261	**0.267**	3
	Left Tilt	-	0.116	-	-	0.159	-	-
	Right Cheek	-	0.105	-	-	0.144	-	-
	Right Tilt	-	0.095	-	-	0.130	-	-
WLAN b-mode 11Mbps	Tuning Target + Tolerance [dBm]	16.50			Scaling factor*			
	Conducted Power [dBm]	-	15.97	-	-	1.03	-	dB
	Time-averaged power [dBm]	-	15.97	-	-	1.27	-	Lin
	Worst case checking: Left Cheek	-	0.119	-	-	0.151	-	-

Values in following combined SAR tables are reported SAR values.

Simultaneous transmissions: Combined head SAR results – Individual band Max results

Test configuration	Max. 1g SAR results		
	WLAN	GSM 850	4-slot GPRS1900
Head: Left, Cheek	0.267	0.675	0.727
Head: Left, Tilt	0.159	0.275	0.254
Head: Right, Cheek	0.144	0.592	1.000
Head: Right, Tilt	0.130	0.284	0.222

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

Test configuration	Max. 1g SAR results	
	GSM850 + WLAN	4-slot GPRS1900 + WLAN
Head: Left, Cheek	**0.942**	0.994
Head: Left, Tilt	0.434	0.413
Head: Right, Cheek	0.736	**1.144**
Head: Right, Tilt	0.414	0.352

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.

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

Test configuration	Max. 1g SAR results	
	GSM850 + WLAN	4-slot GPRS1900 + WLAN
Head: Left, Cheek	**0.704**	-
Head: Left, Tilt	-	-
Head: Right, Cheek	-	**0.993**
Head: Right, Tilt	-	-

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.

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

850MHz Body SAR results

Mode	Device orientation		Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Plot #
			Ch 128	Ch 190	Ch 251	Ch 128	Ch 190	Ch 251	
			824.2 MHz	836.6 MHz	848.8 MHz	824.2 MHz	836.6 MHz	848.8 MHz	
GSM	Tuning Target + Tolerance [dBm]		32.85			Scaling factor*			
	Conducted Slot Average Power [dBm]		32.98	32.90	32.89	0.50	0.50	0.50	dB
	Time-averaged power [dBm]		23.95	23.87	23.86	1.12	1.12	1.12	Lin
	Back facing phantom	Without headset	**0.522**	0.483	0.504	**0.586**	0.542	0.565	6
		Headset WH-108	-	0.335	-	-	0.376	-	-
	Display facing phantom	Without headset	-	0.348	-	-	0.390	-	-
		Headset WH-108	-	0.240	-	-	0.269	-	-

1900MHz Body SAR results

Mode	Device orientation		Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Plot #
			Ch 512	Ch 661	Ch 810	Ch 512	Ch 661	Ch 810	
			1850.2 MHz	1880.0 MHz	1909.8 MHz	1850.2 MHz	1880.0 MHz	1909.8 MHz	
4-slot GPRS	Tuning Target + Tolerance [dBm]		24.85			Scaling factor*			
	Conducted Slot Average Power [dBm]		25.37	25.52	25.47	0.50	0.50	0.50	dB
	Time-averaged power [dBm]		22.36	22.51	22.46	1.12	1.12	1.12	Lin
	Back facing phantom	Without headset	-	0.329	-	-	0.369	-	-
		Headset WH-108	0.295	**0.339**	0.266	0.331	**0.380**	0.298	7
	Display facing phantom	Without headset	-	0.271	-	-	0.304	-	-
		Headset WH-108	-	0.262	-	-	0.294	-	-

2450MHz Body SAR results

Mode	Device orientation		Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Plot #
			Ch 1	Ch 6	Ch 11	Ch 1	Ch 6	Ch 11	
			2412.0 MHz	2437.0 MHz	2462.0 MHz	2412.0 MHz	2437.0 MHz	2462.0 MHz	
WLAN b-mode 1Mbps	Tuning Target + Tolerance [dBm]		16.50			Scaling factor*			
	Conducted Power [dBm]		16.27	15.64	16.30	0.73	1.36	0.70	dB
	Time-averaged power [dBm]		16.27	15.64	16.30	1.18	1.37	1.17	Lin
	Back facing phantom	Without headset	-	0.084	-	-	0.115	-	-
		Headset WH-108	0.079	0.085	**0.092**	0.093	**0.116**	0.108	8
	Display facing phantom	Without headset	-	0.030	-	-	0.041	-	-
		Headset WH-108	-	0.020	-	-	0.027	-	-
WLAN b-mode 11Mbps	Tuning Target + Tolerance [dBm]		16.50			Scaling factor*			
	Conducted Power [dBm]		-	15.97	-	-	1.03	-	dB
	Time-averaged power [dBm]		-	15.97	-	-	1.27	-	Lin
	Worst case checking: Back facing phantom, Headset WH-108		-	0.048	-	-	0.061	-	-

Values in following combined SAR tables are reported SAR values.

Simultaneous transmissions: Combined body SAR results – Individual band Max results

Test configuration	Max. 1g SAR results		
	WLAN	GSM850	4-slot GPRS1900
Body: Back facing phantom, Without Headset	0.115	0.586	0.369
Body: Back facing phantom, Headset WH-108	0.116	0.376	0.380
Body: Display facing phantom, Without Headset	0.041	0.390	0.304
Body: Display facing phantom, Headset WH-108	0.027	0.269	0.294

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

	Max. 1g SAR results	
Test configuration	**GSM 850 + WLAN**	**4-slot GPRS1900+WLAN**
Body: Back facing phantom, Without Headset	**0.701**	0.484
Body: Back facing phantom, Headset WH-108	0.492	**0.496**
Body: Display facing phantom, Without Headset	0.431	0.345
Body: Display facing phantom, Headset WH-108	0.296	0.321

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 table in Section 1.2.

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

	Max. 1g SAR results	
Test configuration	**GSM 850 + WLAN**	**4-slot GPRS1900+WLAN**
Body: Back facing phantom, Without Headset	**0.615**	-
Body: Back facing phantom, Headset WH-108	-	**0.398**
Body: Display facing phantom, Without Headset	-	-
Body: Display facing phantom, Headset WH-108	-	-

Plots of the Measurement scans are given in Appendix B.

APPENDIX A: SYSTEM CHECKING SCANS

Date/Time: 2013-01-10 9:42:58

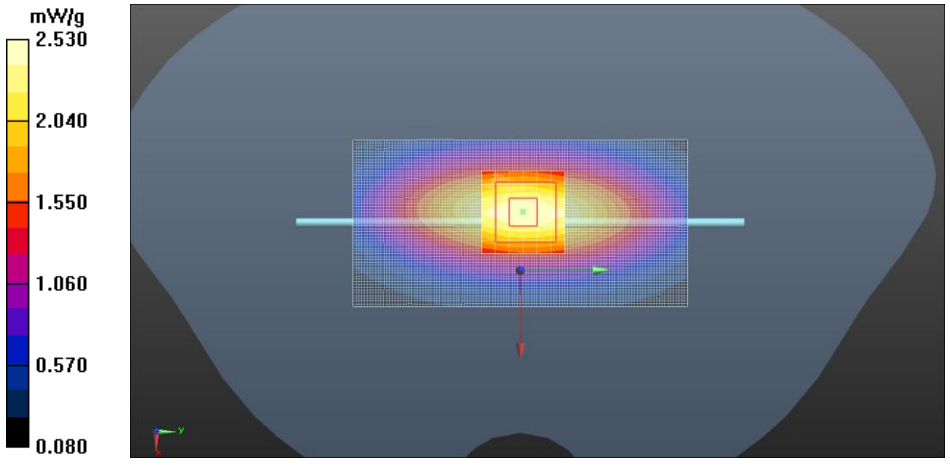
Test Laboratory: TCC Nokia
Type: D835V2; Serial: 4d005

Communication System: CW835
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: Head 835 SAM10; Medium Notes: Medium Temperature: t= 22.3 C
Medium parameters used: f = 835 MHz; σ = 0.89 mho/m; ε_r = 41.051; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY Configuration:
- Probe: EX3DV4 - SN3838
- ConvF(8.67, 8.67, 8.67); Calibrated: 2012-02-20;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2012-02-15
- Phantom: SAM10; Type: SAM; Serial: TP - 1410
- Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.5 (6469)

d=15mm, Pin=250mW/Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.53 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.319 V/m
Peak SAR (extrapolated) = 3.561 mW/g
SAR(1 g) = 2.35 mW/g
SAR(10 g) = 1.54 mW/g
Power Drift = -0.04 dB
Maximum value of SAR (measured) = 2.55 mW/g



Date/Time: 2013-01-11 9:48:53

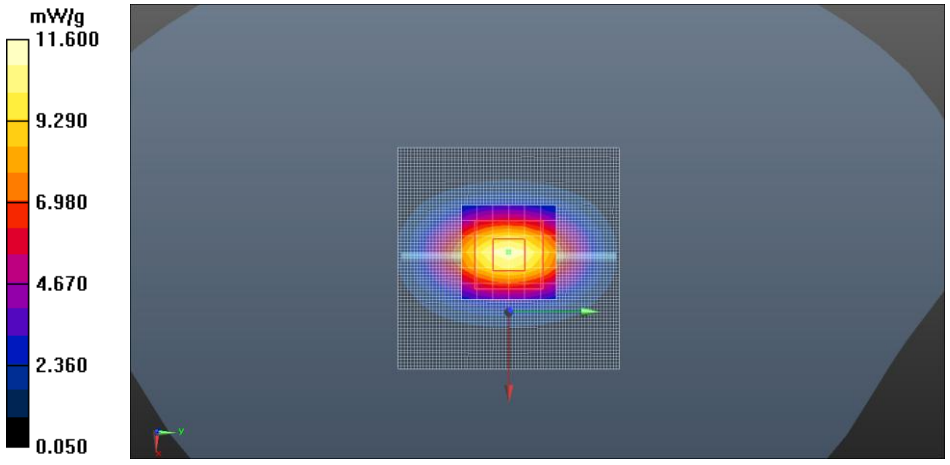
Test Laboratory: TCC Nokia
Type: D1900V2; Serial: 547

Communication System: CW1900
Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: Head 1900; Medium Notes: Medium Temperature: t=22.0
Medium parameters used: f = 1900 MHz; σ = 1.458 mho/m; ε_r = 39.724; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY Configuration:
- Probe: EX3DV4 - SN3839
- ConvF(7.38, 7.38, 7.38); Calibrated: 2012-10-25;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn860; Calibrated: 2012-10-17
- Phantom: SAM4; Type: SAM; Serial: TP - 1427
- Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.5 (6469)

d=10mm, Pin=250mW/Area Scan (71x71x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 11.6 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 88.907 V/m
Peak SAR (extrapolated) = 19.483 mW/g
SAR(1 g) = 10.2 mW/g
SAR(10 g) = 5.23 mW/g
Power Drift = -0.09 dB
Maximum value of SAR (measured) = 11.5 mW/g



Date/Time: 2013-01-11 9:42:29

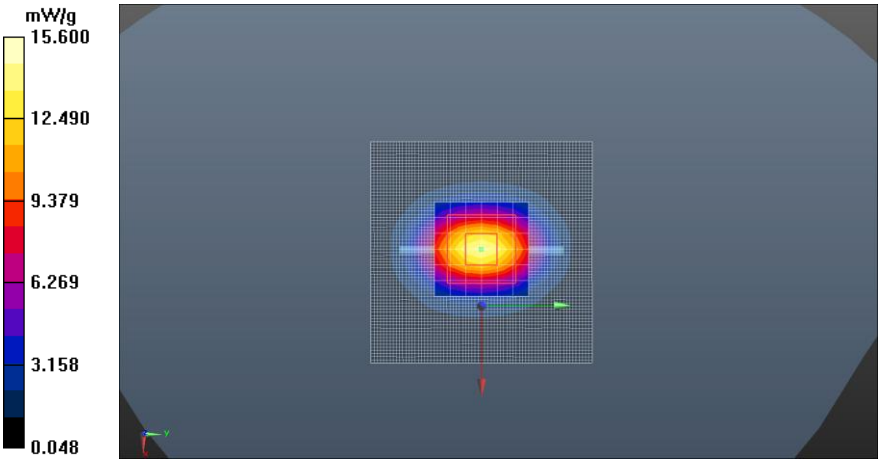
Test Laboratory: TCC Nokia
Type: D2450V2; Serial: D2450V2 - SN: 883

Communication System: CW2450
Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: Head 2450; Medium Notes: Medium Temperature: t=21.1 C
Medium parameters used: f = 2450 MHz; σ = 1.84 mho/m; ε_r = 38.821; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY Configuration:
- Probe: EX3DV4 - SN3574
- ConvF(6.55, 6.55, 6.55); Calibrated: 2012-10-18;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn480; Calibrated: 2012-10-17
- Phantom: SAM8; Type: SAM; Serial: TP - 1215
- Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.5 (6469)

d=10mm, Pin=250mW/Area Scan (71x71x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 15.6 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.094 V/m
Peak SAR (extrapolated) = 27.413 mW/g
SAR(1 g) = 13.2 mW/g
SAR(10 g) = 6.11 mW/g
Power Drift = -0.01 dB
Maximum value of SAR (measured) = 15.0 mW/g



Date/Time: 2013-01-15 9:51:44

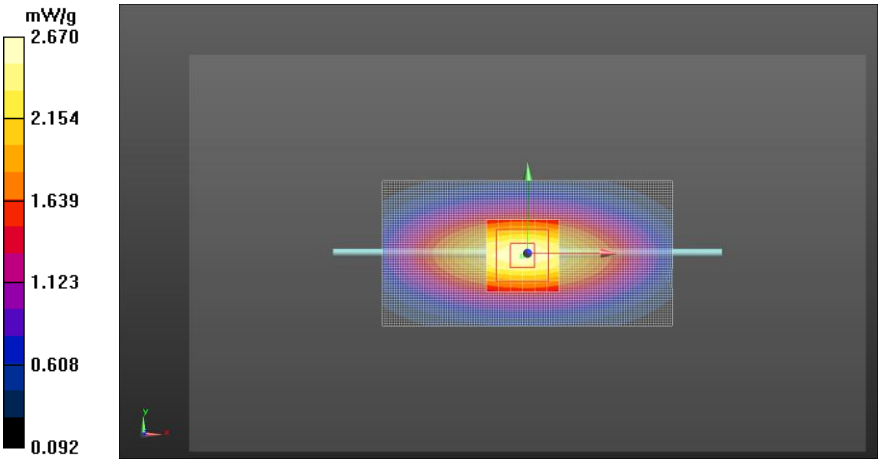
Test Laboratory: TCC Nokia
Type: D835V2; Serial: 479

Communication System: CW850
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: Body 835; Medium Notes: Medium Temperature: t= 22.0 C
Medium parameters used: f = 835 MHz; σ = 0.957 mho/m; ε_r = 54.705; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY Configuration:
- Probe: EX3DV4 - SN3839
- ConvF(8.97, 8.97, 8.97); Calibrated: 2012-10-25;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn860; Calibrated: 2012-10-17
- Phantom: TFP3; Type: QD 000 P51 CA; Serial: 1130
- Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.5 (6469)

d=15mm, Pin=250mW/Area Scan (121x61x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.67 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.073 V/m
Peak SAR (extrapolated) = 3.615 mW/g
SAR(1 g) = 2.46 mW/g
SAR(10 g) = 1.63 mW/g
Power Drift = -0.04 dB
Maximum value of SAR (measured) = 2.64 mW/g



Date/Time: 2013-01-15 12:43:46

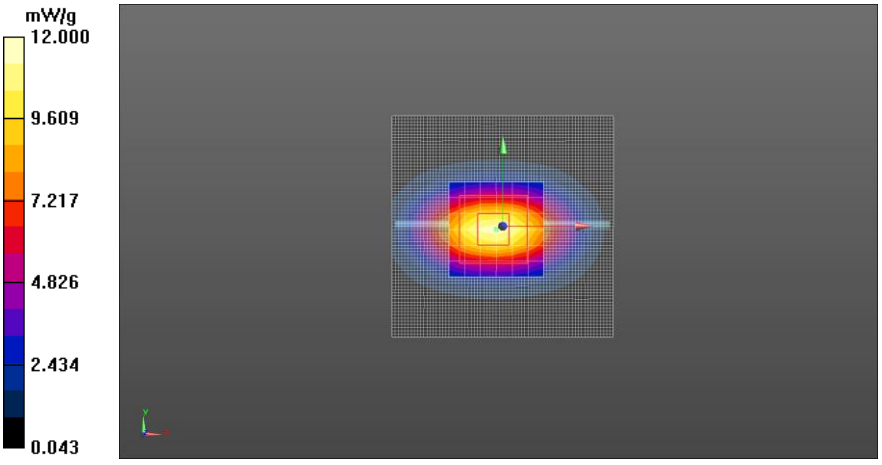
Test Laboratory: TCC Nokia
Type: D1900V2; Serial: 547

Communication System: CW1900
Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: Body 1900; Medium Notes: Medium Temperature: t=22.0
Medium parameters used: f = 1900 MHz; σ = 1.544 mho/m; ε_r = 52.411; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY Configuration:
- Probe: EX3DV4 - SN3839
- ConvF(7.03, 7.03, 7.03); Calibrated: 2012-10-25;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn860; Calibrated: 2012-10-17
- Phantom: TFP3; Type: QD 000 P51 CA; Serial: 1130
- Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.5 (6469)

d=10mm, Pin=250mW/Area Scan (71x71x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 12.0 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 86.782 V/m
Peak SAR (extrapolated) = 18.995 mW/g
SAR(1 g) = 10.4 mW/g
SAR(10 g) = 5.45 mW/g
Power Drift = 0.00 dB
Maximum value of SAR (measured) = 11.8 mW/g



Date/Time: 2013-01-10 9:41:42

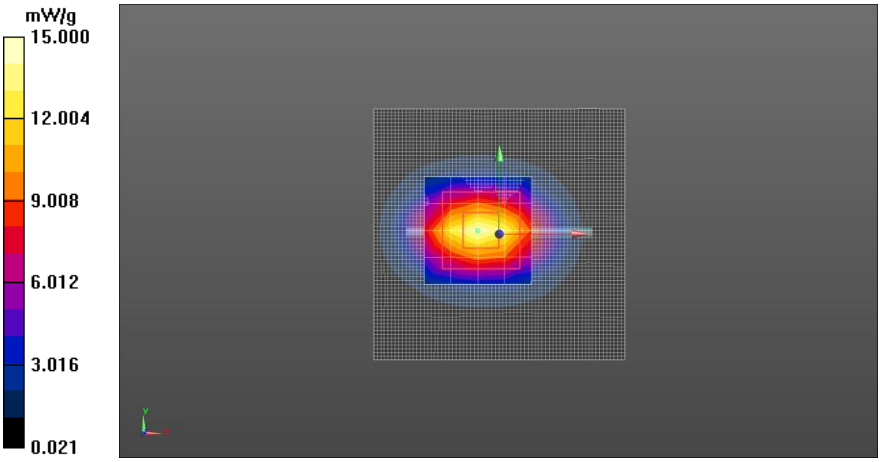
Test Laboratory: TCC Nokia
Type: D2450V2; Serial: D2450V2 - SN: 760

Communication System: CW2450
Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: Body 2450; Medium Notes: Medium Temperature: t=21.8C
Medium parameters used: f = 2450 MHz; σ = 1.884 mho/m; ε_r = 50.578; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY Configuration:
- Probe: EX3DV4 - SN3574
- ConvF(6.47, 6.47, 6.47); Calibrated: 2011-10-25;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn480; Calibrated: 2012-10-17
- Phantom: TFP3; Type: QD 000 P51 CA; Serial: 1130
- Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.5 (6469)

d=10mm, Pin=250mW/Area Scan (71x71x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 15.0 mW/g

d=10mm, Pin=250mW/Zoom Scan (5x5x7) (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 85.597 V/m
Peak SAR (extrapolated) = 26.035 mW/g
SAR(1 g) = 12.9 mW/g
SAR(10 g) = 6.04 mW/g
Power Drift = -0.03 dB
Maximum value of SAR (measured) = 14.8 mW/g



APPENDIX B: MAXIMUM MEASUREMENT PLOTS

Plot 1: GSM850	Left Cheek, High Channel	
	Measured SAR value:	**0.602W/kg** in 1g
Plot 2: 4-slot GPRS1900	Right Cheek, Middle Channel	
	Measured SAR value:	**0.891W/kg** in 1g
Plot 3: WLAN2450	Left Cheek, High Channel	
	Measured SAR value:	**0.227W/kg** in 1g
Plot 4.1: GSM850 + WLAN2450	Left Cheek	
	Measured SAR value:	**0.628W/kg** in 1g
Plot 4.2: GSM850 + WLAN2450	Left Cheek	
	Reported SAR value:	**0.704W/kg** in 1g
Plot 5: 4-slot GPRS1900 + WLAN2450	Right Cheek	
	Reported SAR value:	**0.993W/kg** in 1g
Plot 6: GSM850	Back Facing Phantom, No Accessory, Low Channel	
	Measured SAR value:	**0.522W/kg** in 1g
Plot 7: 4-slot GPRS1900	Back Facing Phantom, No Accessory, Middle Channel	
	Measured SAR value:	**0.339W/kg** in 1g
Plot 8: WLAN2450	Back Facing Phantom, WH-108, High Channel	
	Measured SAR value:	**0.092W/kg** in 1g
Plot 9.1: GSM850 + WLAN2450	Back Facing Phantom, No Accessory	
	Measured SAR value:	**0.543W/kg** in 1g
Plot 9.2: GSM850 + WLAN2450	Back Facing Phantom, No Accessory	
	Reported SAR value:	**0.615W/kg** in 1g
Plot 10.1: 4-slot GPRS1900 + WLAN2450	Back Facing Phantom, WH-108	
	Measured SAR value:	**0.355W/kg** in 1g
Plot 10.2: 4-slot GPRS1900 + WLAN2450	Back Facing Phantom, WH-108	
	Reported SAR value:	**0.398W/kg** in 1g

Plot 1: GSM850 Left Cheek, High Channel Measured SAR value: **0.602W/kg** in 1g
Date/Time: 2013-01-10 13:07:32

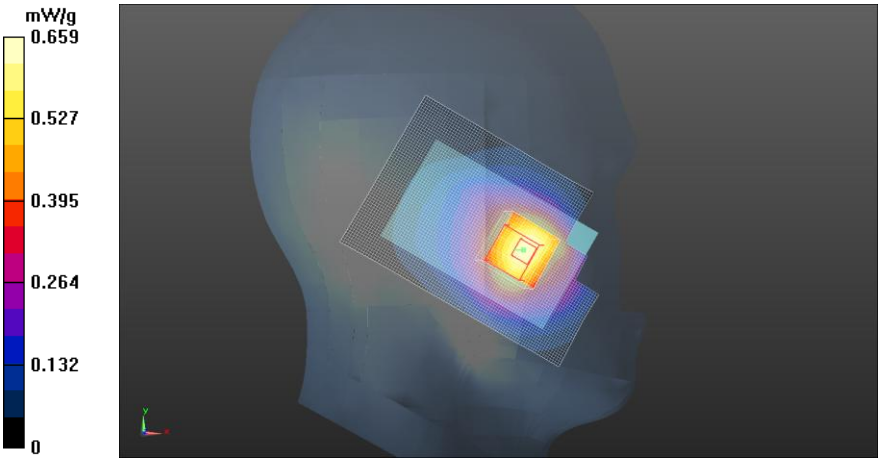
Test Laboratory: TCC Nokia
Type: RM-900; Serial: 004402/47/128607/4

Communication System: GSM850
Frequency: 848.8 MHz; Duty Cycle: 1:8.3
Medium: Head 835 SAM10; Medium Notes: Medium Temperature: t= 22.3 C
Medium parameters used: f = 849 MHz; σ = 0.899 mho/m; ε_r = 40.968; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY Configuration:
- Probe: EX3DV4 - SN3838
- ConvF(8.67, 8.67, 8.67); Calibrated: 2012-02-20;
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2012-02-15
- Phantom: SAM10; Type: SAM; Serial: TP - 1410
- Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.5 (6469)

Cheek - High/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.659 mW/g

Cheek - High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 9.417 V/m
Peak SAR (extrapolated) = 0.905 mW/g
SAR(1 g) = 0.602 mW/g
SAR(10 g) = 0.409 mW/g
Power Drift = 0.13 dB
Maximum value of SAR (measured) = 0.643 mW/g



Plot 2: 4-slot GPRS1900 Right Cheek, Middle Channel Measured SAR value: **0.891W/kg** in 1g

Date/Time: 2013-01-11 11:34:22

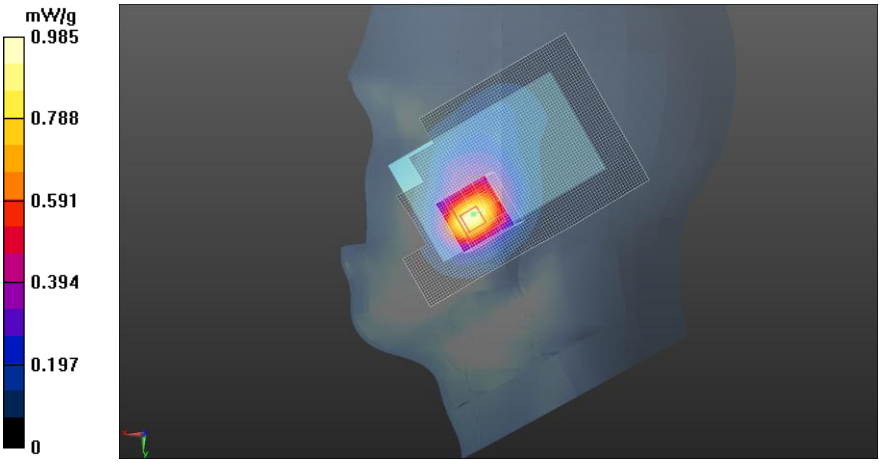
Test Laboratory: TCC Nokia
Type: RM-900; Serial: 004402/47/128607/4

Communication System: 4-slot GPRS1900
Frequency: 1880 MHz; Duty Cycle: 1:2.08
Medium: Head 1900; Medium Notes: Medium Temperature: t=22.0
Medium parameters used: f = 1880 MHz; σ = 1.444 mho/m; ε_r = 39.813; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY Configuration:
- Probe: EX3DV4 - SN3839
- ConvF(7.38, 7.38, 7.38); Calibrated: 2012-10-25;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn860; Calibrated: 2012-10-17
- Phantom: SAM4; Type: SAM; Serial: TP - 1427
- Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.5 (6469)

Cheek - Middle/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.985 mW/g

Cheek - Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 6.497 V/m
Peak SAR (extrapolated) = 1.650 mW/g
SAR(1 g) = 0.891 mW/g
SAR(10 g) = 0.464 mW/g
Power Drift = -0.08 dB
Maximum value of SAR (measured) = 0.976 mW/g



Plot 3: WLAN2450 Left Cheek, High Channel Measured SAR value: **0.227W/kg** in 1g
Date/Time: 2013-01-11 12:50:18

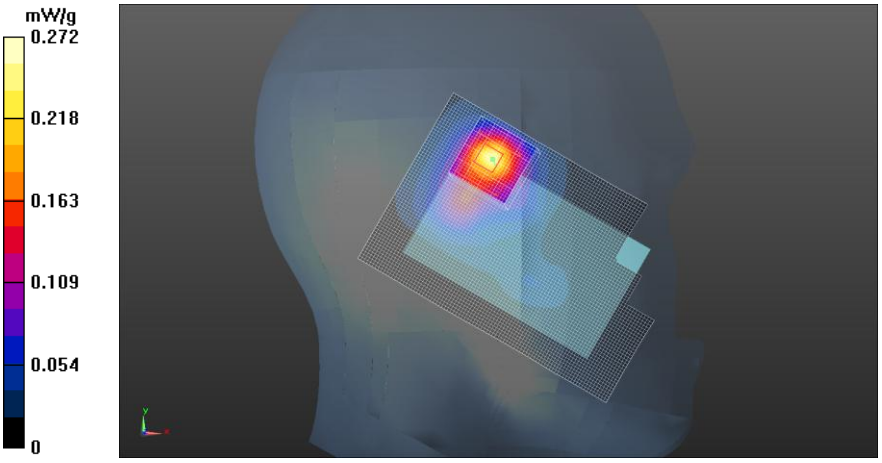
Test Laboratory: TCC Nokia
Type: RM-900; Serial: 004402/47/128598/5

Communication System: WLAN2450 b-mode
Frequency: 2462 MHz; Duty Cycle: 1:1
Medium: Head 2450; Medium Notes: Medium Temperature: t=21.1 C
Medium parameters used: f = 2462 MHz; σ = 1.852 mho/m; ε_r = 38.77; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY Configuration:
- Probe: EX3DV4 - SN3574
- ConvF(6.55, 6.55, 6.55); Calibrated: 2012-10-18;
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn480; Calibrated: 2012-10-17
- Phantom: SAM8; Type: SAM; Serial: TP - 1215
- Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.5 (6469)

Cheek - High/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.272 mW/g

Cheek - High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 7.747 V/m
Peak SAR (extrapolated) = 0.511 mW/g
SAR(1 g) = 0.227 mW/g
SAR(10 g) = 0.105 mW/g
Power Drift = 0.19 dB
Maximum value of SAR (measured) = 0.246 mW/g



Plot 4.1: GSM850 + WLAN2450 Left Cheek Reported SAR value: **0.628W/kg** in 1g
Date/Time: 2013-01-10 13:07:32

DASY Configuration for Cheek - High/Area Scan:
Test Laboratory: TCC Nokia
Type: RM-900; Serial: 004402/47/128607/4
Communication System: GSM850; Frequency: 848.8 MHz; Duty Cycle: 1:8.3; PMF: 2.88097
Medium: Head 835 SAM10 Medium parameters used: f = 849 MHz; σ = 0.899 mho/m; ε_r = 40.968; ρ = 1000 kg/m^3
Phantom section: Left Section

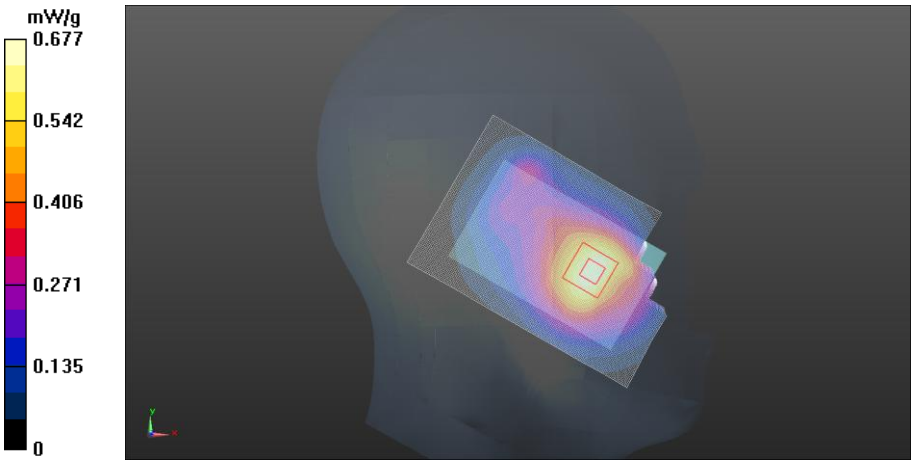
Probe: EX3DV4 - SN3838; ConvF(8.67, 8.67, 8.67); Calibrated: 2012-02-20;
Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))
Electronics: DAE4 Sn1324; Calibrated: 2012-02-15
Phantom: SAM10; Type: SAM; Serial: TP - 1410
Measurement SW: DASY4, Version 4.7 (80)

Date/Time: 2013-01-11 12:50:18

DASY Configuration for Cheek - High US/Area Scan:
Test Laboratory: TCC Nokia
Type: RM-900; Serial: 004402/47/128598/5
Communication System: WLAN2450 b-mode; Frequency: 2462 MHz; Duty Cycle: 1:1; PMF: 1
Medium: Head 2450 Medium parameters used: f = 2462 MHz; σ = 1.852 mho/m; ε_r = 38.77; ρ = 1000 kg/m^3
Phantom section: Left Section

Probe: EX3DV4 - SN3574; ConvF(6.55, 6.55, 6.55); Calibrated: 2012-10-18;
Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))
Electronics: DAE4 Sn480; Calibrated: 2012-10-17
Phantom: SAM8; Type: SAM; Serial: TP - 1215
Measurement SW: DASY4, Version 4.7 (80)

Fast SAR of Combined Scans: SAR(1 g) = 0.628 mW/g; SAR(10 g) = 0.423 mW/g
Maximum value of SAR (interpolated) = 0.677 mW/g



Plot 4.2: GSM850 + WLAN2450 Left Cheek Reported SAR value: **0.704W/kg** in 1g
Date/Time: 2013-01-10 13:07:32

DASY Configuration for Cheek - High/Area Scan:
Test Laboratory: TCC Nokia
Type: RM-900; Serial: 004402/47/128607/4
Communication System: GSM850; Frequency: 848.8 MHz; Duty Cycle: 1:8.3; PMF: 2.88097
Medium: Head 835 SAM10 Medium parameters used: f = 849 MHz; σ = 0.899 mho/m; ε_r = 40.968; ρ = 1000 kg/m^3
Phantom section: Left Section

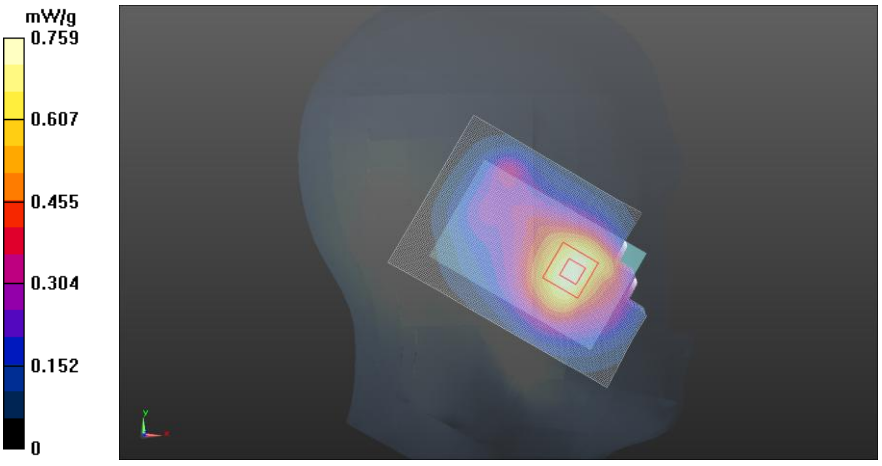
Probe: EX3DV4 - SN3838; ConvF(8.67, 8.67, 8.67); Calibrated: 2012-02-20;
Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))
Electronics: DAE4 Sn1324; Calibrated: 2012-02-15
Phantom: SAM10; Type: SAM; Serial: TP - 1410
Measurement SW: DASY4, Version 4.7 (80)

Date/Time: 2013-01-11 12:50:18

DASY Configuration for Cheek - High/Area Scan:
Test Laboratory: TCC Nokia
Type: RM-900; Serial: 004402/47/128598/5
Communication System: WLAN2450 b-mode; Frequency: 2462 MHz; Duty Cycle: 1:1; PMF: 1
Medium: Head 2450 Medium parameters used: f = 2462 MHz; σ = 1.852 mho/m; ε_r = 38.77; ρ = 1000 kg/m^3
Phantom section: Left Section

Probe: EX3DV4 - SN3574; ConvF(6.55, 6.55, 6.55); Calibrated: 2012-10-18;
Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))
Electronics: DAE4 Sn480; Calibrated: 2012-10-17
Phantom: SAM8; Type: SAM; Serial: TP - 1215
Measurement SW: DASY4, Version 4.7 (80)

Fast SAR of Combined Scans: SAR(1 g) = 0.704 mW/g; SAR(10 g) = 0.474 mW/g
Maximum value of SAR (interpolated) = 0.759 mW/g



Note: WLAN result was scaled by a factor of 1.17 and GSM850 result was scaled by a factor of 1.12 before combining.

Plot 5: 4-slot GPRS1900 + WLAN2450 Right Cheek Reported SAR value: **0.993W/kg** in 1g
Date/Time: 2013-01-11 11:34:22

DASY Configuration for Cheek - Middle/Area Scan:
Test Laboratory: TCC Nokia
Type: RM-900; Serial: 004402/47/128607/4
Communication System: 4-slot GPRS1900; Frequency: 1880 MHz; Duty Cycle: 1:2.08; PMF: 1.44222
Medium: Head 1900 Medium parameters used: f = 1880 MHz; σ = 1.444 mho/m; ε_r = 39.813; ρ = 1000 kg/m^3
Phantom section: Right Section

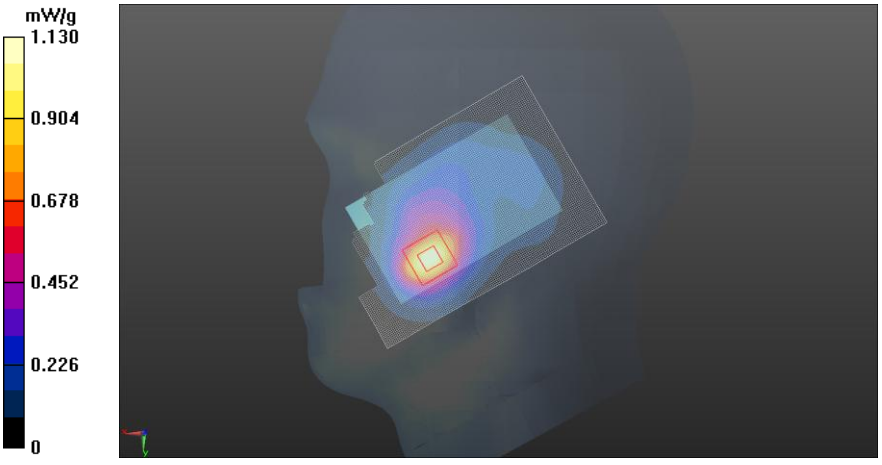
Probe: EX3DV4 - SN3839; ConvF(7.38, 7.38, 7.38); Calibrated: 2012-10-25;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn860; Calibrated: 2012-10-17
Phantom: SAM4; Type: SAM; Serial: TP - 1427
Measurement SW: DASY4, Version 4.7 (80)

Date/Time: 2013-01-11 11:25:44

DASY Configuration for Cheek - Middle/Area Scan:
Test Laboratory: TCC Nokia
Type: RM-900; Serial: 004402/47/128598/5
Communication System: WLAN2450 b-mode; Frequency: 2437 MHz; Duty Cycle: 1:1; PMF: 1
Medium: Head 2450 Medium parameters used: f = 2437 MHz; σ = 1.825 mho/m; ε_r = 38.867; ρ = 1000 kg/m^3
Phantom section: Right Section

Probe: EX3DV4 - SN3574; ConvF(6.55, 6.55, 6.55); Calibrated: 2012-10-18;
Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))
Electronics: DAE4 Sn480; Calibrated: 2012-10-17
Phantom: SAM8; Type: SAM; Serial: TP - 1215
Measurement SW: DASY4, Version 4.7 (80)

Fast SAR of Combined Scans: SAR(1 g) = 0.993 mW/g; SAR(10 g) = 0.520 mW/g
Maximum value of SAR (interpolated) = 1.13 mW/g



Note: WLAN result was scaled by a factor of 1.37 and 4-slot GPRS1900 result was scaled by a factor of 1.12 before combining.

Plot 6: GSM850 Back Facing Phantom, No Accessory, Low Channel Measured SAR value: **0.522W/kg** in 1g

Date/Time: 2013-01-15 11:16:56

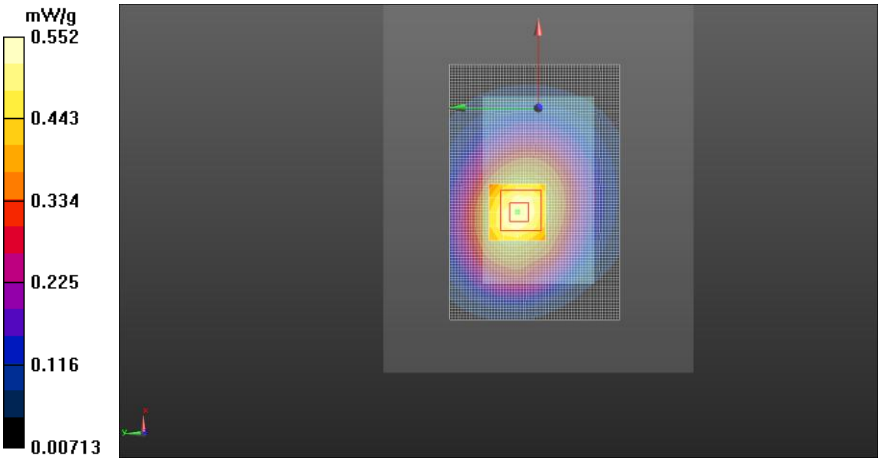
Test Laboratory: TCC Nokia
Type: RM-900; Serial: 004402/47/128607/4

Communication System: GSM850
Frequency: 824.2 MHz; Duty Cycle: 1:8.3
Medium: Body 835; Medium Notes: Medium Temperature: t= 22.0 C
Medium parameters used (interpolated): f = 824.2 MHz; σ = 0.946 mho/m; ε_r = 54.809; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY Configuration:
- Probe: EX3DV4 - SN3839
- ConvF(8.97, 8.97, 8.97); Calibrated: 2012-10-25;
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn860; Calibrated: 2012-10-17
- Phantom: TFP3; Type: QD 000 P51 CA; Serial: 1130
- Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.5 (6469)

Body - Low - No Accessory - Back Facing Phantom/Area Scan (91x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.552 mW/g

Body - Low - No Accessory - Back Facing Phantom/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 10.372 V/m
Peak SAR (extrapolated) = 0.695 mW/g
SAR(1 g) = 0.522 mW/g
SAR(10 g) = 0.376 mW/g
Power Drift = -0.00 dB
Maximum value of SAR (measured) = 0.551 mW/g



Plot 7: 4-slot GPRS1900 Back Facing Phantom, No Accessory, Middle Channel Measured SAR value: **0.339W/kg** in 1g

Date/Time: 2013-01-15 13:18:01

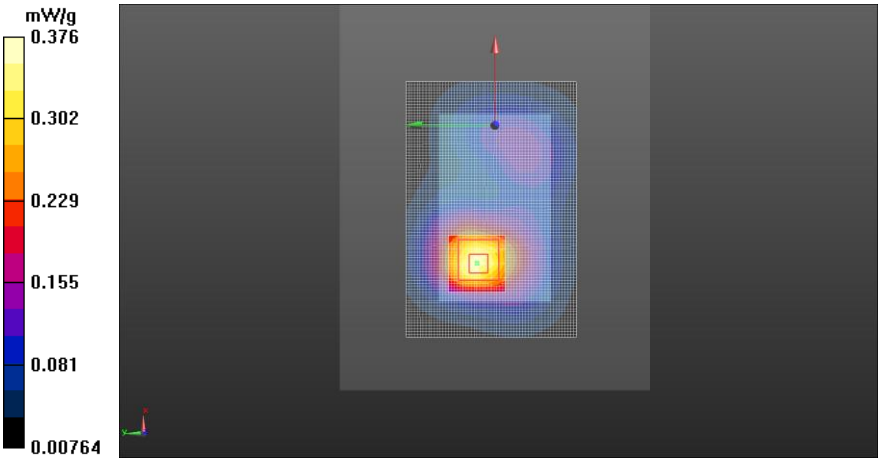
Test Laboratory: TCC Nokia
Type: RM-900; Serial: 004402/47/128607/4

Communication System: 4-slot GPRS1900
Frequency: 1880 MHz; Duty Cycle: 1:2.08
Medium: Body 1900; Medium Notes: Medium Temperature: t=22.0
Medium parameters used: f = 1880 MHz; σ = 1.526 mho/m; ε_r = 52.458; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY Configuration:
- Probe: EX3DV4 - SN3839
- ConvF(7.03, 7.03, 7.03); Calibrated: 2012-10-25;
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn860; Calibrated: 2012-10-17
- Phantom: TFP3; Type: QD 000 P51 CA; Serial: 1130
- Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.5 (6469)

Body - Middle - WH-108 - Back Facing Phantom/Area Scan (91x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.376 mW/g

Body - Middle - WH-108 - Back Facing Phantom/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 8.857 V/m
Peak SAR (extrapolated) = 0.523 mW/g
SAR(1 g) = 0.339 mW/g
SAR(10 g) = 0.206 mW/g
Power Drift = 0.01 dB
Maximum value of SAR (measured) = 0.368 mW/g



Plot 8: WLAN2450 Back Facing Phantom, WH-108, High Channel Measured SAR value: **0.092W/kg** in 1g

Date/Time: 2013-01-10 11:12:43

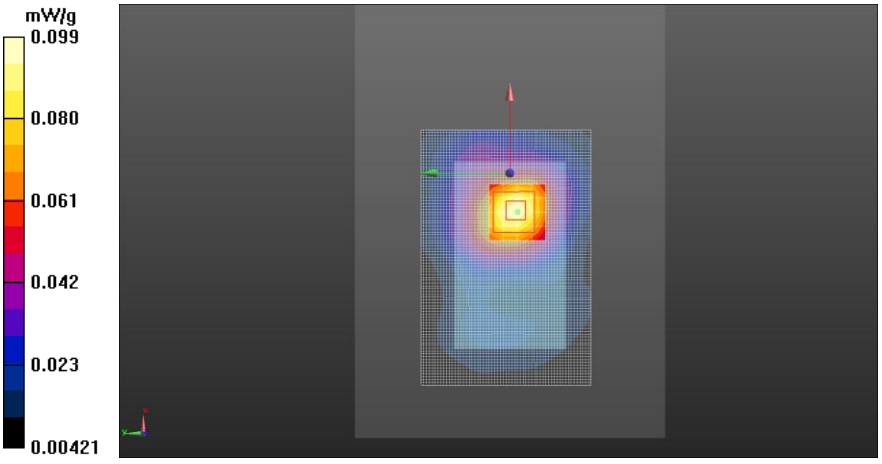
Test Laboratory: TCC Nokia
Type: RM-900; Serial: 004402/47/128598/5

Communication System: WLAN2450 b-mode
Frequency: 2462 MHz; Duty Cycle: 1:1
Medium: Body 2450; Medium Notes: Medium Temperature: t=21.8C
Medium parameters used: f = 2462 MHz; σ = 1.903 mho/m; ε_r = 50.539; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY Configuration:
- Probe: EX3DV4 - SN3574
- ConvF(6.47, 6.47, 6.47); Calibrated: 2011-10-25;
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn480; Calibrated: 2012-10-17
- Phantom: TFP3; Type: QD 000 P51 CA; Serial: 1130
- Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.5 (6469)

Body - High - WH-108 - Back Facing Phantom/Area Scan (91x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.0984 mW/g

Body - High - WH-108 - Back Facing Phantom/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 5.128 V/m
Peak SAR (extrapolated) = 0.150 mW/g
SAR(1 g) = 0.092 mW/g
SAR(10 g) = 0.055 mW/g
Power Drift = 0.08 dB
Maximum value of SAR (measured) = 0.0993 mW/g



Plot 9.1: GSM850 + WLAN2450 Back Facing Phantom, No Accessory Reported SAR value: **0.543W/kg** in 1g

Date/Time: 2013-01-15 11:16:56

DASY Configuration for Body - Low - No Accessory - Back Facing Phantom/Area Scan:
Test Laboratory: TCC Nokia
Type: RM-900; Serial: 004402/47/128607/4
Communication System: GSM850; Frequency: 824.2 MHz; Duty Cycle: 1:8.3; PMF: 2.88097
Medium: Body 835 Medium parameters used (interpolated): f = 824.2 MHz; σ = 0.946 mho/m; ε_r = 54.809; ρ = 1000 kg/m^3
Phantom section: Center Section

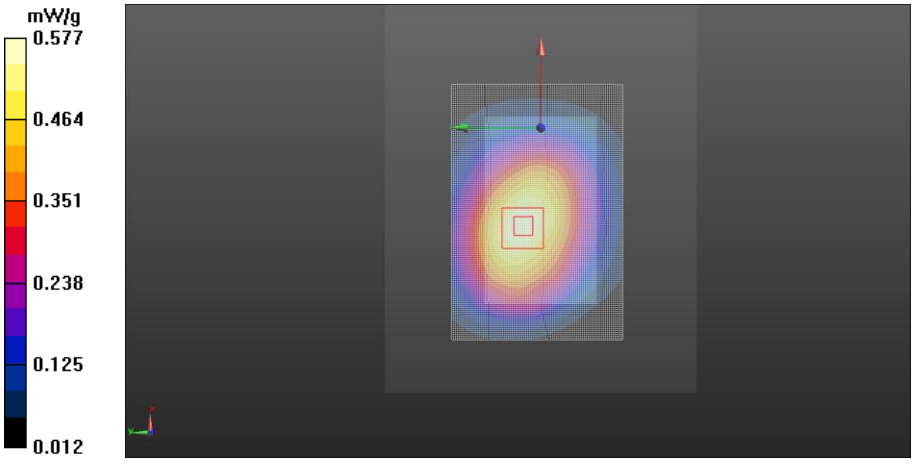
Probe: EX3DV4 - SN3839; ConvF(8.97, 8.97, 8.97); Calibrated: 2012-10-25;
Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))
Electronics: DAE4 Sn860; Calibrated: 2012-10-17
Phantom: TFP3; Type: QD 000 P51 CA; Serial: 1130
Measurement SW: DASY4, Version 4.7 (80)

Date/Time: 2013-01-10 10:12:35

DASY Configuration for Body - Middle - No Accessory - Back Facing Phantom/Area Scan:
Test Laboratory: TCC Nokia
Type: RM-900; Serial: 004402/47/128598/5
Communication System: WLAN2450 b-mode; Frequency: 2437 MHz; Duty Cycle: 1:1; PMF: 1
Medium: Body 2450 Medium parameters used: f = 2437 MHz; σ = 1.865 mho/m; ε_r = 50.604; ρ = 1000 kg/m^3
Phantom section: Center Section

Probe: EX3DV4 - SN3574; ConvF(6.47, 6.47, 6.47); Calibrated: 2011-10-25;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn480; Calibrated: 2012-10-17
Phantom: TFP3; Type: QD 000 P51 CA; Serial: 1130
Measurement SW: DASY4, Version 4.7 (80)

Fast SAR of Combined Scans: SAR(1 g) = 0.543 mW/g; SAR(10 g) = 0.378 mW/g
Maximum value of SAR (interpolated) = 0.577 mW/g



Plot 9.2: GSM850 + WLAN2450 Back Facing Phantom, No Accessory Reported SAR value: **0.615W/kg** in 1g

Date/Time: 2013-01-15 11:16:56

DASY Configuration for Body - Low - No Accessory - Back Facing Phantom/Area Scan:
Test Laboratory: TCC Nokia
Type: RM-900; Serial: 004402/47/128607/4
Communication System: GSM850; Frequency: 824.2 MHz; Duty Cycle: 1:8.3; PMF: 2.88097
Medium: Body 835 Medium parameters used (interpolated): f = 824.2 MHz; σ = 0.946 mho/m; ε_r = 54.809; ρ = 1000 kg/m^3
Phantom section: Center Section

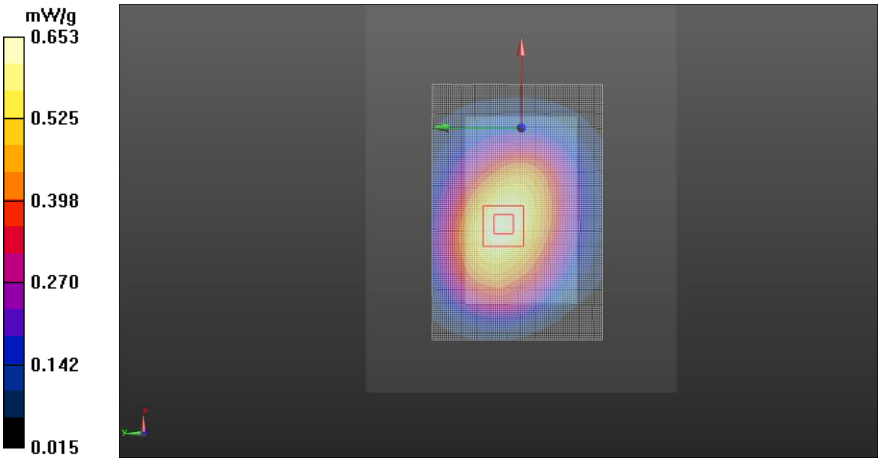
Probe: EX3DV4 - SN3839; ConvF(8.97, 8.97, 8.97); Calibrated: 2012-10-25;
Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))
Electronics: DAE4 Sn860; Calibrated: 2012-10-17
Phantom: TFP3; Type: QD 000 P51 CA; Serial: 1130
Measurement SW: DASY4, Version 4.7 (80)

Date/Time: 2013-01-10 10:12:35

DASY Configuration for Body - Middle - No Accessory - Back Facing Phantom/Area Scan:
Test Laboratory: TCC Nokia
Type: RM-900; Serial: 004402/47/128598/5
Communication System: WLAN2450 b-mode; Frequency: 2437 MHz; Duty Cycle: 1:1; PMF: 1
Medium: Body 2450 Medium parameters used: f = 2437 MHz; σ = 1.865 mho/m; ε_r = 50.604; ρ = 1000 kg/m^3
Phantom section: Center Section

Probe: EX3DV4 - SN3574; ConvF(6.47, 6.47, 6.47); Calibrated: 2011-10-25;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn480; Calibrated: 2012-10-17
Phantom: TFP3; Type: QD 000 P51 CA; Serial: 1130
Measurement SW: DASY4, Version 4.7 (80)

Fast SAR of Combined Scans: SAR(1 g) = 0.615 mW/g; SAR(10 g) = 0.427 mW/g
Maximum value of SAR (interpolated) = 0.653 mW/g



Note: WLAN result was scaled by a factor of 1.37 and GSM850 result was scaled by a factor of 1.12 before combining.

Plot 10.1: 4-slot GPRS1900 + WLAN2450 Back Facing Phantom, WH-108 Reported SAR value: **0.355W/kg** in 1g

Date/Time: 2013-01-15 13:18:01

DASY Configuration for Body - Middle - WH-108 - Back Facing Phantom/Area Scan:
Test Laboratory: TCC Nokia
Type: RM-900; Serial: 004402/47/128607/4
Communication System: 4-slot GPRS1900; Frequency: 1880 MHz; Duty Cycle: 1:2.08; PMF: 1.44222
Medium: Body 1900 Medium parameters used: f = 1880 MHz; σ = 1.526 mho/m; ε_r = 52.458; ρ = 1000 kg/m^3
Phantom section: Center Section

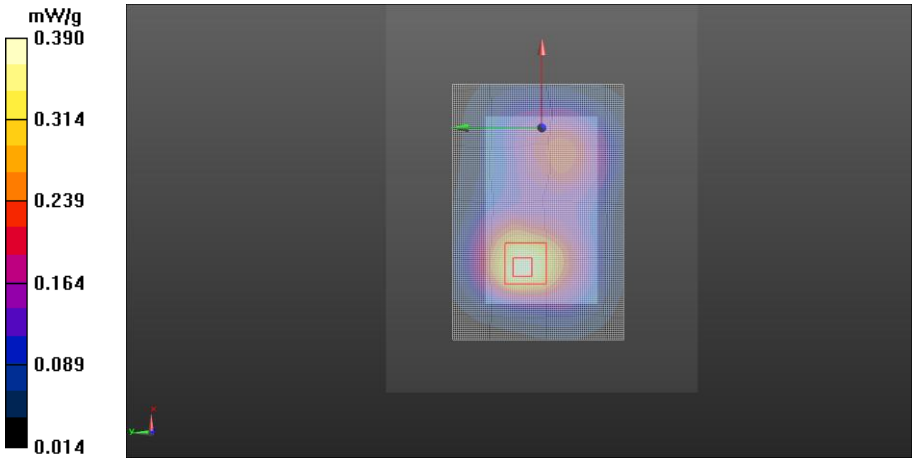
Probe: EX3DV4 - SN3839; ConvF(7.03, 7.03, 7.03); Calibrated: 2012-10-25;
Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))
Electronics: DAE4 Sn860; Calibrated: 2012-10-17
Phantom: TFP3; Type: QD 000 P51 CA; Serial: 1130
Measurement SW: DASY4, Version 4.7 (80)

Date/Time: 2013-01-10 11:12:43

DASY Configuration for Body - High - WH-108 - Back Facing Phantom/Area Scan:
Test Laboratory: TCC Nokia
Type: RM-900; Serial: 004402/47/128598/5
Communication System: WLAN2450 b-mode; Frequency: 2462 MHz; Duty Cycle: 1:1; PMF: 1
Medium: Body 2450 Medium parameters used: f = 2462 MHz; σ = 1.903 mho/m; ε_r = 50.539; ρ = 1000 kg/m^3
Phantom section: Center Section

Probe: EX3DV4 - SN3574; ConvF(6.47, 6.47, 6.47); Calibrated: 2011-10-25;
Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))
Electronics: DAE4 Sn480; Calibrated: 2012-10-17
Phantom: TFP3; Type: QD 000 P51 CA; Serial: 1130
Measurement SW: DASY4, Version 4.7 (80)

Fast SAR of Combined Scans: SAR(1 g) = 0.355 mW/g; SAR(10 g) = 0.208 mW/g
Maximum value of SAR (interpolated) = 0.390 mW/g



Plot 10.2: 4-slot GPRS1900 + WLAN2450 Back Facing Phantom, WH-108 Reported SAR value: **0.398W/kg** in 1g

Date/Time: 2013-01-15 13:18:01

DASY Configuration for Body - Middle - WH-108 - Back Facing Phantom/Area Scan:
Test Laboratory: TCC Nokia
Type: RM-900; Serial: 004402/47/128607/4
Communication System: 4-slot GPRS1900; Frequency: 1880 MHz; Duty Cycle: 1:2.08; PMF: 1.44222
Medium: Body 1900 Medium parameters used: f = 1880 MHz; σ = 1.526 mho/m; ε_r = 52.458; ρ = 1000 kg/m^3
Phantom section: Center Section

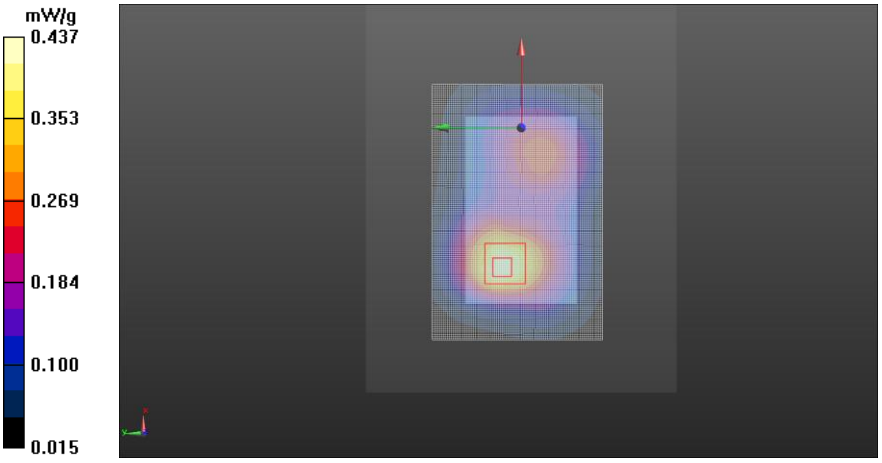
Probe: EX3DV4 - SN3839; ConvF(7.03, 7.03, 7.03); Calibrated: 2012-10-25;
Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))
Electronics: DAE4 Sn860; Calibrated: 2012-10-17
Phantom: TFP3; Type: QD 000 P51 CA; Serial: 1130
Measurement SW: DASY4, Version 4.7 (80)

Date/Time: 2013-01-10 11:12:43

DASY Configuration for Body - High - WH-108 - Back Facing Phantom/Area Scan:
Test Laboratory: TCC Nokia
Type: RM-900; Serial: 004402/47/128598/5
Communication System: WLAN2450 b-mode; Frequency: 2462 MHz; Duty Cycle: 1:1; PMF: 1
Medium: Body 2450 Medium parameters used: f = 2462 MHz; σ = 1.903 mho/m; ε_r = 50.539; ρ = 1000 kg/m^3
Phantom section: Center Section

Probe: EX3DV4 - SN3574; ConvF(6.47, 6.47, 6.47); Calibrated: 2011-10-25;
Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))
Electronics: DAE4 Sn480; Calibrated: 2012-10-17
Phantom: TFP3; Type: QD 000 P51 CA; Serial: 1130
Measurement SW: DASY4, Version 4.7 (80)

Fast SAR of Combined Scans: SAR(1 g) = 0.398 mW/g; SAR(10 g) = 0.234 mW/g
Maximum value of SAR (interpolated) = 0.437 mW/g



Note: WLAN result was scaled by a factor of 1.17 and 4-slot GPRS1900 result was scaled by a factor of 1.12 before combining.

APPENDIX C: DIELECTRIC PARAMETERS OF THE TISSUE SIMULANTS

Head tissue simulant dielectric parameters used in the measurements:

f (MHz)	Date	Dielectric Parameters					
		824.2MHz		837.0MHz		849.0MHz	
		εr	σ [S/m]	εr	σ [S/m]	εr	σ [S/m]
GSM/GPRS850	2013-01-10	41.1	0.88	41.0	0.89	41.0	0.90
f (MHz)	Date	Dielectric Parameters					
		1850.0MHz		1880.0MHz		1910.0MHz	
		εr	σ [S/m]	εr	σ [S/m]	εr	σ [S/m]
GSM/GPRS1900	2013-01-11	40.0	1.42	39.8	1.44	39.7	1.47
f (MHz)	Date	Dielectric Parameters					
		2412.0MHz		2442.0MHz		2462.0MHz	
		εr	σ [S/m]	εr	σ [S/m]	εr	σ [S/m]
WLAN2450	2013-01-11	38.9	1.80	38.9	1.83	38.8	1.85

Body tissue simulant dielectric parameters used in the measurements:

f (MHz)	Date	Dielectric Parameters					
		824.2MHz		837.0MHz		849.0MHz	
		εr	σ [S/m]	εr	σ [S/m]	εr	σ [S/m]
GSM/GPRS850	2013-01-15	54.8	0.95	54.7	0.96	54.6	0.97
f (MHz)	Date	Dielectric Parameters					
		1850.0MHz		1880.0MHz		1910.0MHz	
		εr	σ [S/m]	εr	σ [S/m]	εr	σ [S/m]
GSM/GPRS1900	2013-01-15	52.6	1.50	52.5	1.53	52.4	1.55
f (MHz)	Date	Dielectric Parameters					
		2412.0MHz		2442.0MHz		2462.0MHz	
		εr	σ [S/m]	εr	σ [S/m]	εr	σ [S/m]
WLAN2450	2013-01-10	50.7	1.83	50.6	1.87	50.5	1.90

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

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

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 Beijing TCC**

Certificate No: EX3-3838_Feb12

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3838

Calibration procedure(s): QA CAL-01.v8, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: February 20, 2012

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 ± 3)°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	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 21, 2012

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3838

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.37	0.60	0.53	± 10.1 %
DCP (mV)[B]	105.4	99.8	99.8	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	102.8	±1.9 %
			Y	0.00	0.00	1.00	97.2	
			Z	0.00	0.00	1.00	87.7	

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 max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3838

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
835	41.5	0.90	8.67	8.67	8.67	0.53	0.72	± 12.0 %
1750	40.1	1.37	7.81	7.81	7.81	0.57	0.72	± 12.0 %
1900	40.0	1.40	7.57	7.57	7.57	0.62	0.69	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3838

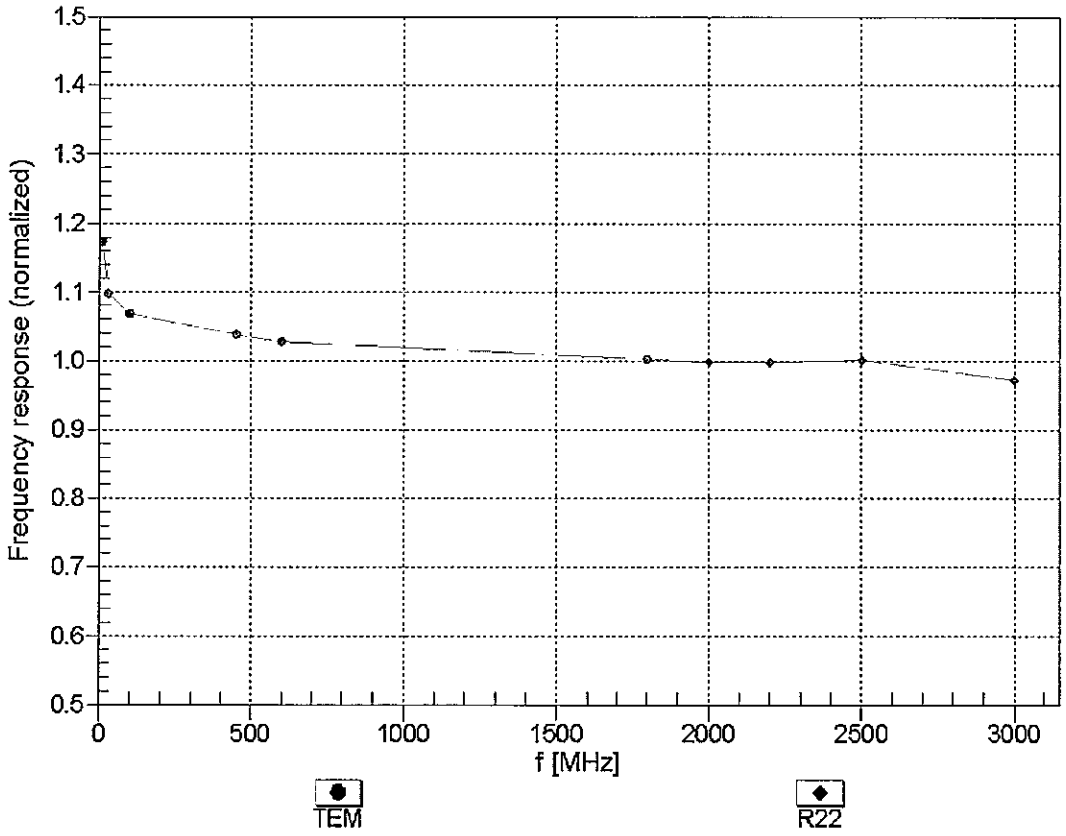
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
835	55.2	0.97	8.86	8.86	8.86	0.52	0.76	± 12.0 %
1750	53.4	1.49	7.72	7.72	7.72	0.49	0.86	± 12.0 %
1900	53.3	1.52	7.35	7.35	7.35	0.30	1.08	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

Frequency Response of E-Field

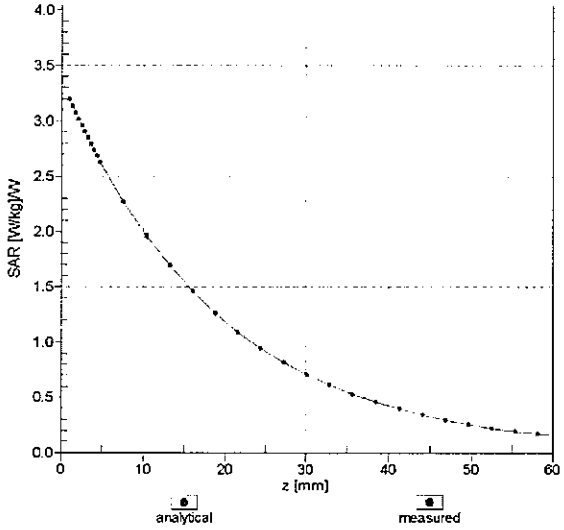
(TEM-Cell:ifi110 EXX, Waveguide: R22)



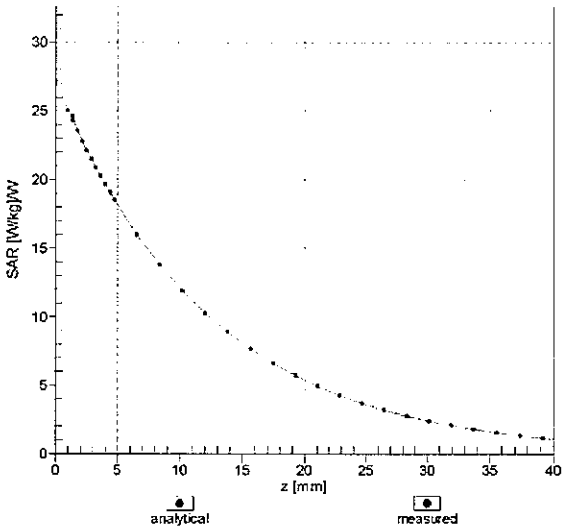
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

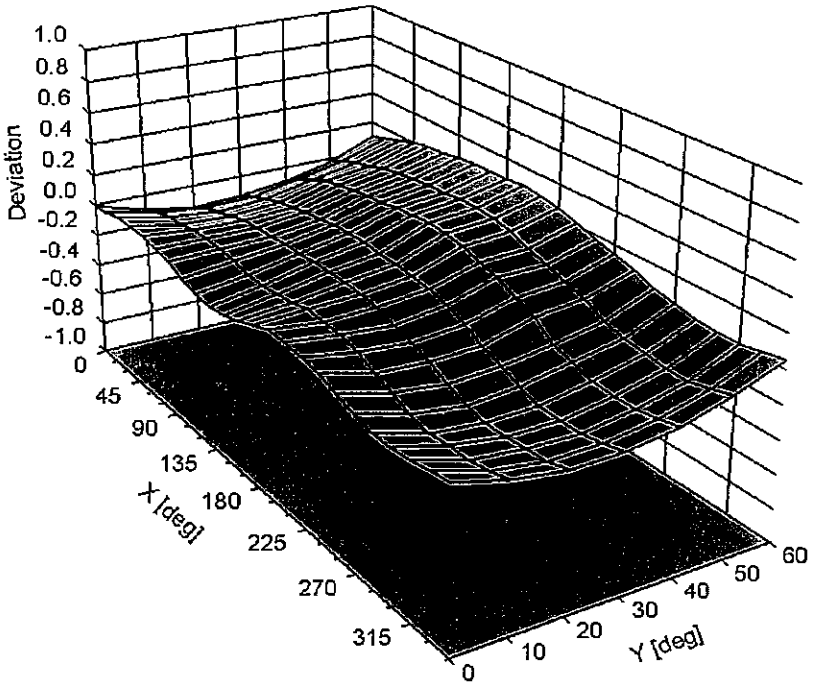


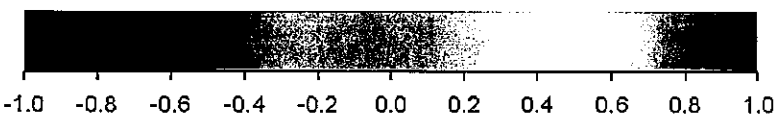
f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

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 Beijing TCC**

Certificate No: EX3-3574_Oct12

CALIBRATION CERTIFICATE

Object EX3DV4 - SN:3574

Calibration procedure(s) QA CAL-01.v8, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: October 18, 2012

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 ± 3)°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	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 660	20-Jun-12 (No. DAE4-660_Jun12)	Jun-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 19, 2012

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3574

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.55	0.46	0.42	± 10.1 %
DCP (mV)[B]	97.2	99.3	101.4	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
0	CW	0.00	X	0.0	0.0	1.0	123.0	±3.0 %
			Y	0.0	0.0	1.0	116.3	
			Z	0.0	0.0	1.0	110.1	

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 max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3574

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
1950	40.0	1.40	7.16	7.16	7.16	0.42	0.81	± 12.0 %
2450	39.2	1.80	6.55	6.55	6.55	0.40	0.86	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3574

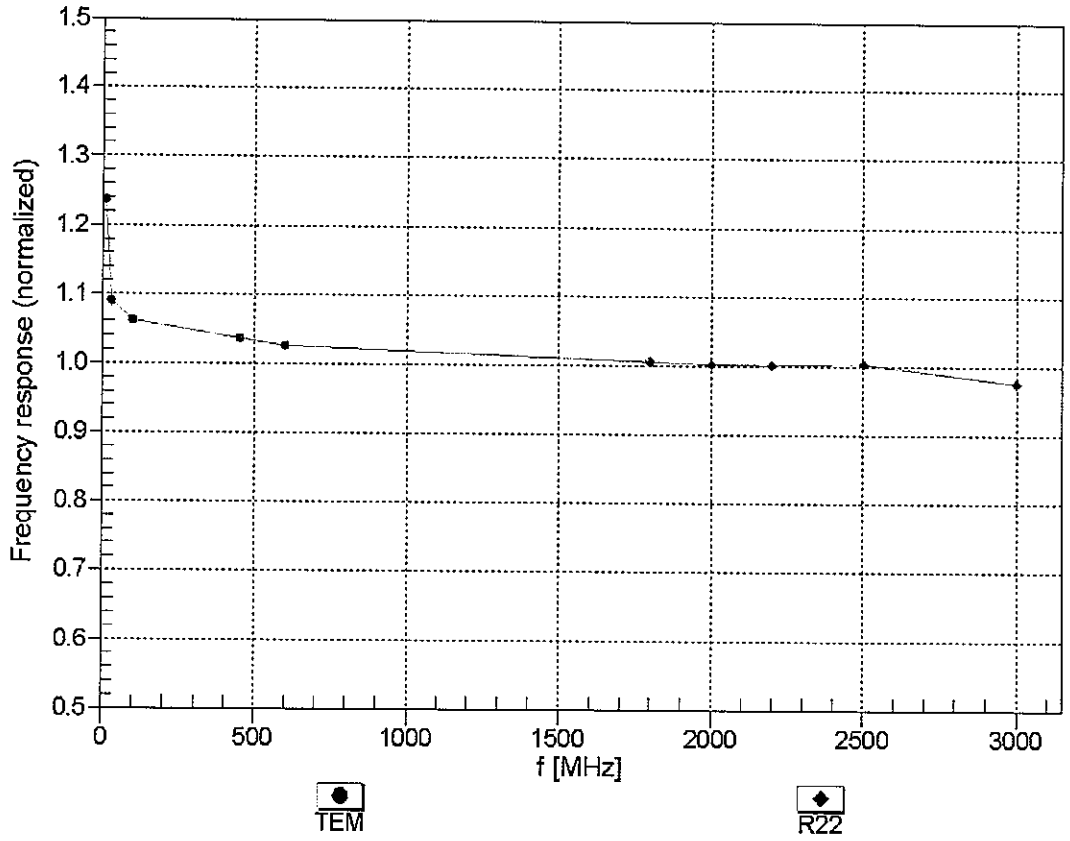
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
1950	53.3	1.52	7.06	7.06	7.06	0.26	1.05	± 12.0 %
2450	52.7	1.95	6.44	6.44	6.44	0.71	0.60	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

Frequency Response of E-Field

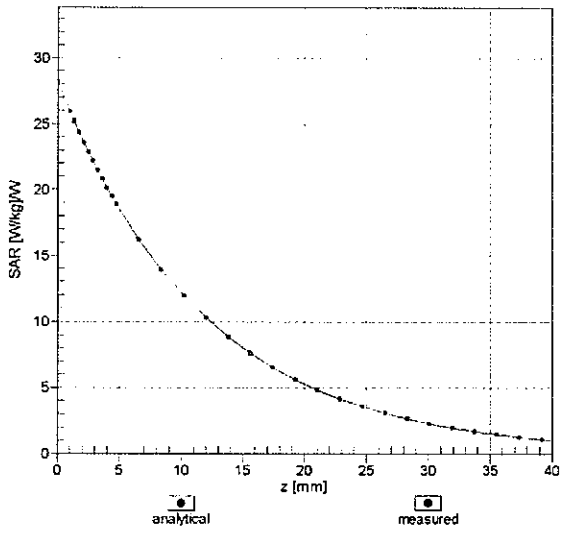
(TEM-Cell:ifi110 EXX, Waveguide: R22)



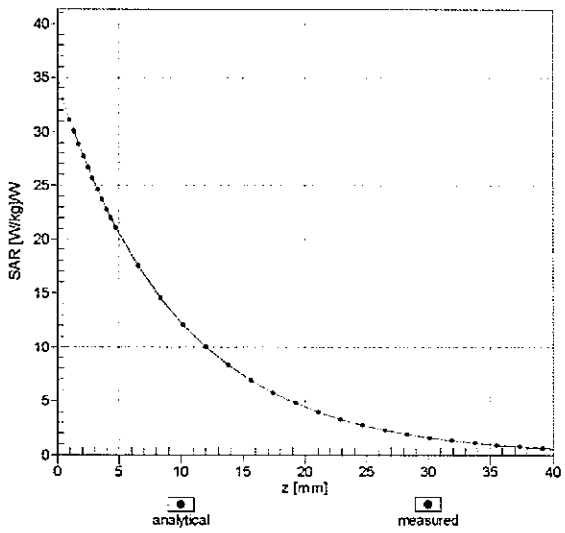
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Conversion Factor Assessment

f = 1950 MHz,WGLS R22 (H_convF)

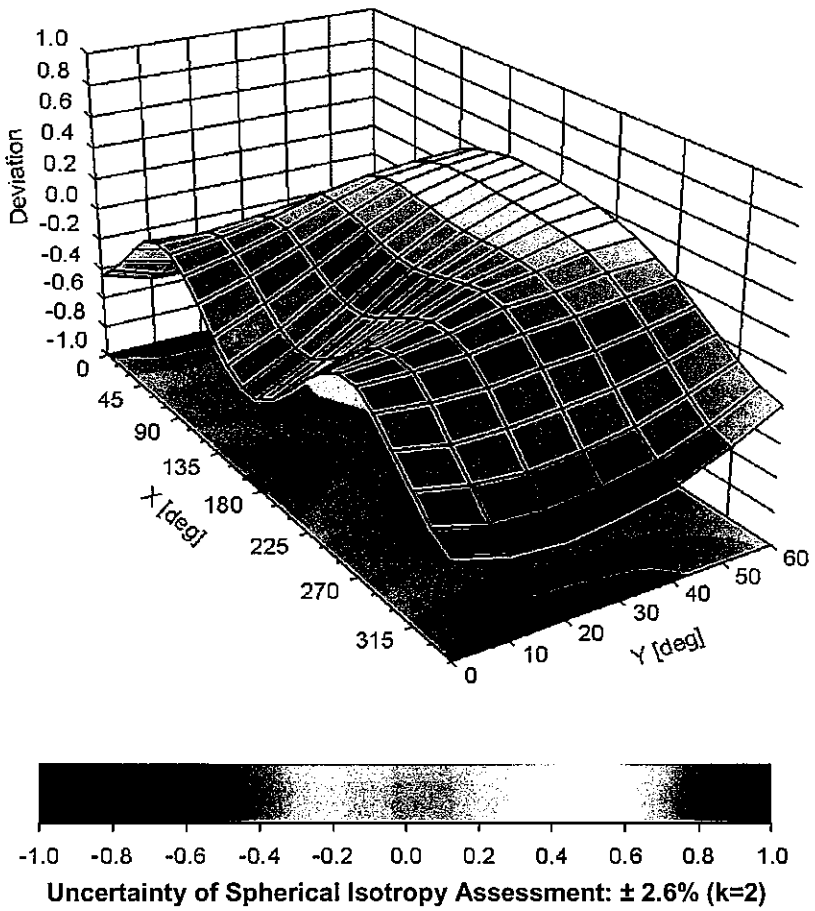


f = 2450 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

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 Beijing TCC**

Certificate No: **EX3-3839_Oct12**

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3839
Calibration procedure(s)	QA CAL-01.v8, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4 Calibration procedure for dosimetric E-field probes
Calibration date:	October 25, 2012

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 ± 3)°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	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 660	20-Jun-12 (No. DAE4-660_Jun12)	Jun-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 25, 2012

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3839

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.48	0.44	0.44	± 10.1 %
DCP (mV)[B]	93.6	98.1	101.1	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
0	CW	0.00	X	0.0	0.0	1.0	115.1	±3.5 %
			Y	0.0	0.0	1.0	153.6	
			Z	0.0	0.0	1.0	147.0	

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 max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3839

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
835	41.5	0.90	8.74	8.74	8.74	0.39	0.85	± 12.0 %
1750	40.1	1.37	7.95	7.95	7.95	0.25	1.02	± 12.0 %
1900	40.0	1.40	7.38	7.38	7.38	0.69	0.64	± 12.0 %
5200	36.0	4.66	5.04	5.04	5.04	0.35	1.80	± 13.1 %
5300	35.9	4.76	4.87	4.87	4.87	0.35	1.80	± 13.1 %
5500	35.6	4.96	4.66	4.66	4.66	0.35	1.80	± 13.1 %
5600	35.5	5.07	4.37	4.37	4.37	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.44	4.44	4.44	0.40	1.80	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

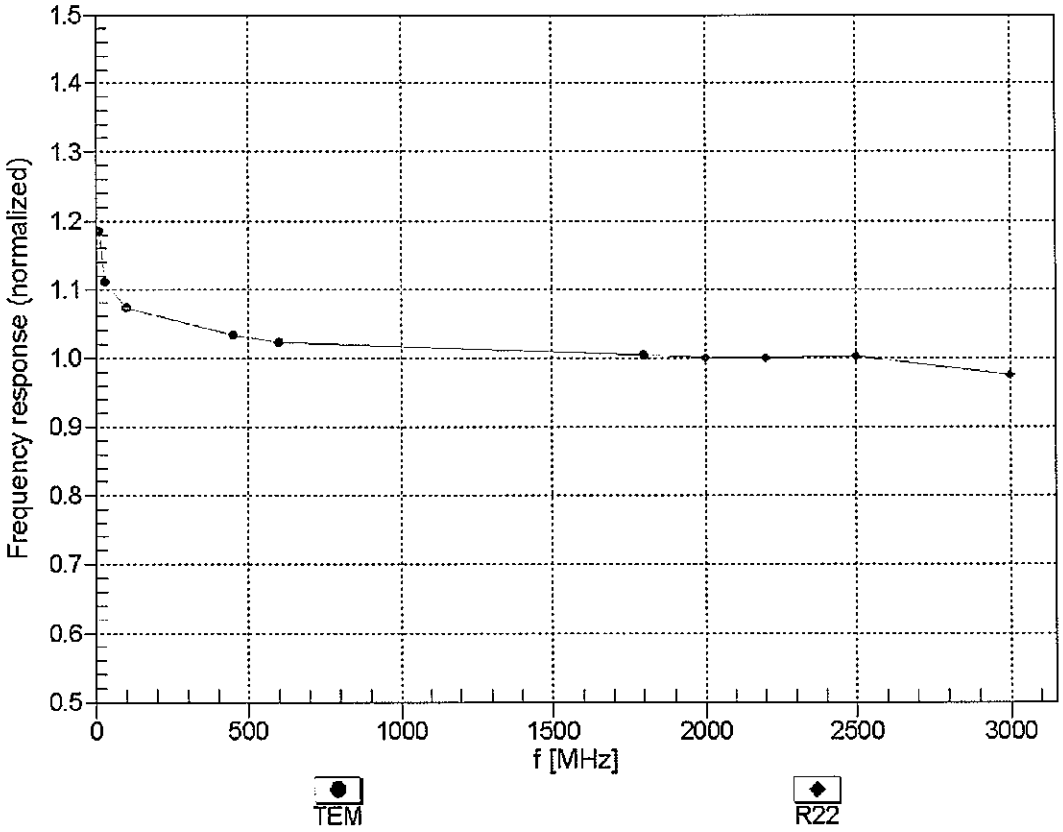
DASY/EASY - Parameters of Probe: EX3DV4 - SN:3839

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
835	55.2	0.97	8.97	8.97	8.97	0.38	0.92	± 12.0 %
1750	53.4	1.49	7.26	7.26	7.26	0.54	0.73	± 12.0 %
1900	53.3	1.52	7.03	7.03	7.03	0.29	1.01	± 12.0 %
5200	49.0	5.30	4.32	4.32	4.32	0.40	1.90	± 13.1 %
5300	48.9	5.42	4.07	4.07	4.07	0.42	1.90	± 13.1 %
5500	48.6	5.65	3.89	3.89	3.89	0.45	1.90	± 13.1 %
5600	48.5	5.77	3.86	3.86	3.86	0.44	1.90	± 13.1 %
5800	48.2	6.00	4.18	4.18	4.18	0.45	1.90	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

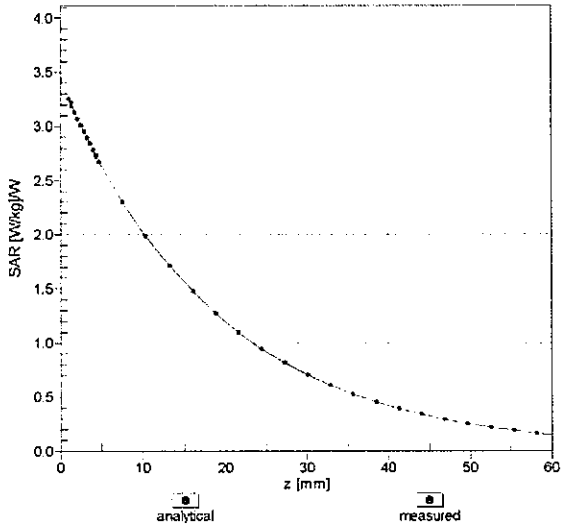
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



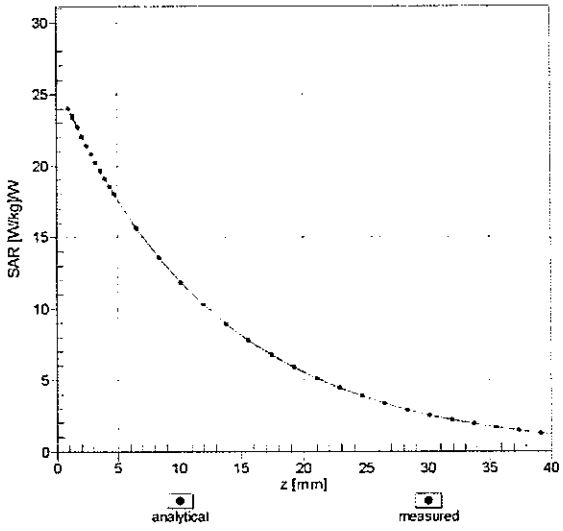
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

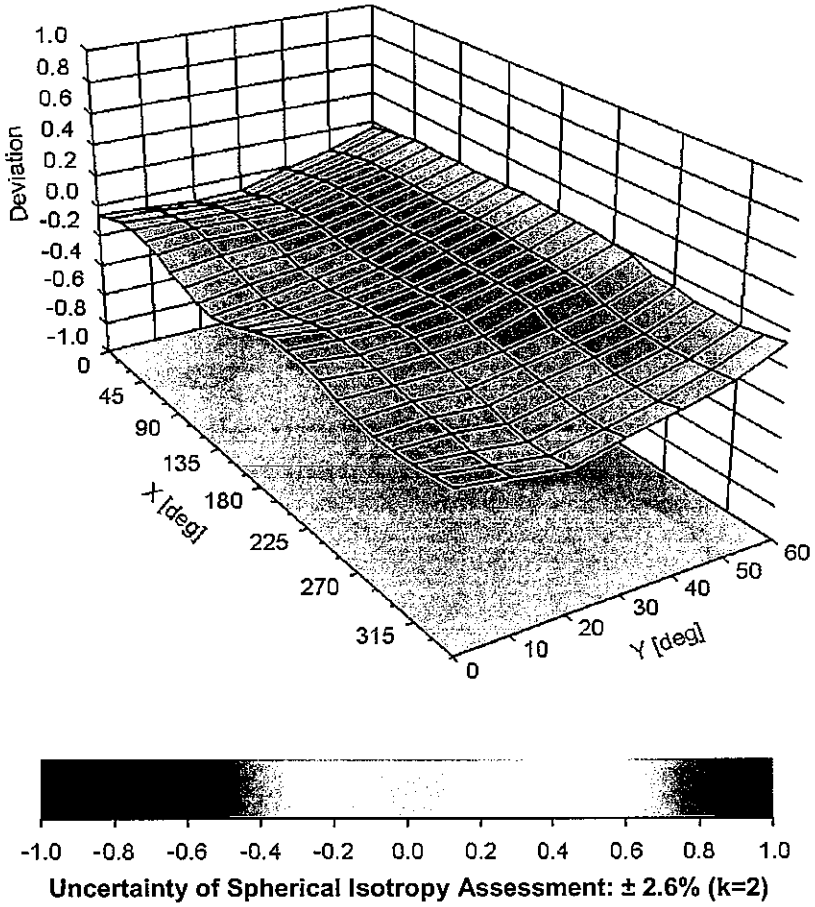


f = 1750 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

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 Beijing TCC**

Certificate No: D835V2-4d005_Mar12

CALIBRATION CERTIFICATE

Object: D835V2 - SN: 4d005

Calibration procedure(s): QA CAL-05.v8
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: March 06, 2012

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 ± 3)°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	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5086 (20g)	29-Mar-11 (No. 217-01368)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	Israe El-Naouq
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 6, 2012

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.7 Ω - 3.4 jΩ
Return Loss	- 27.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.8 Ω - 5.1 jΩ
Return Loss	- 24.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.394 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 11, 2003

DASY5 Validation Report for Head TSL

Date: 06.03.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d005

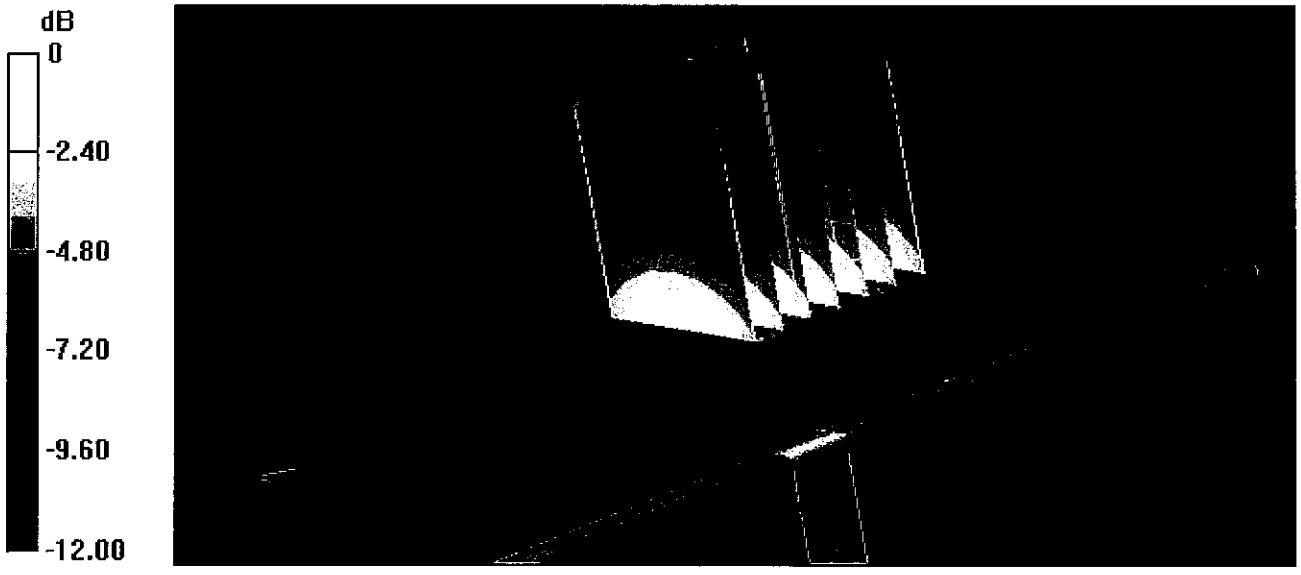
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.89 mho/m; ε_r = 41.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.07, 6.07, 6.07); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

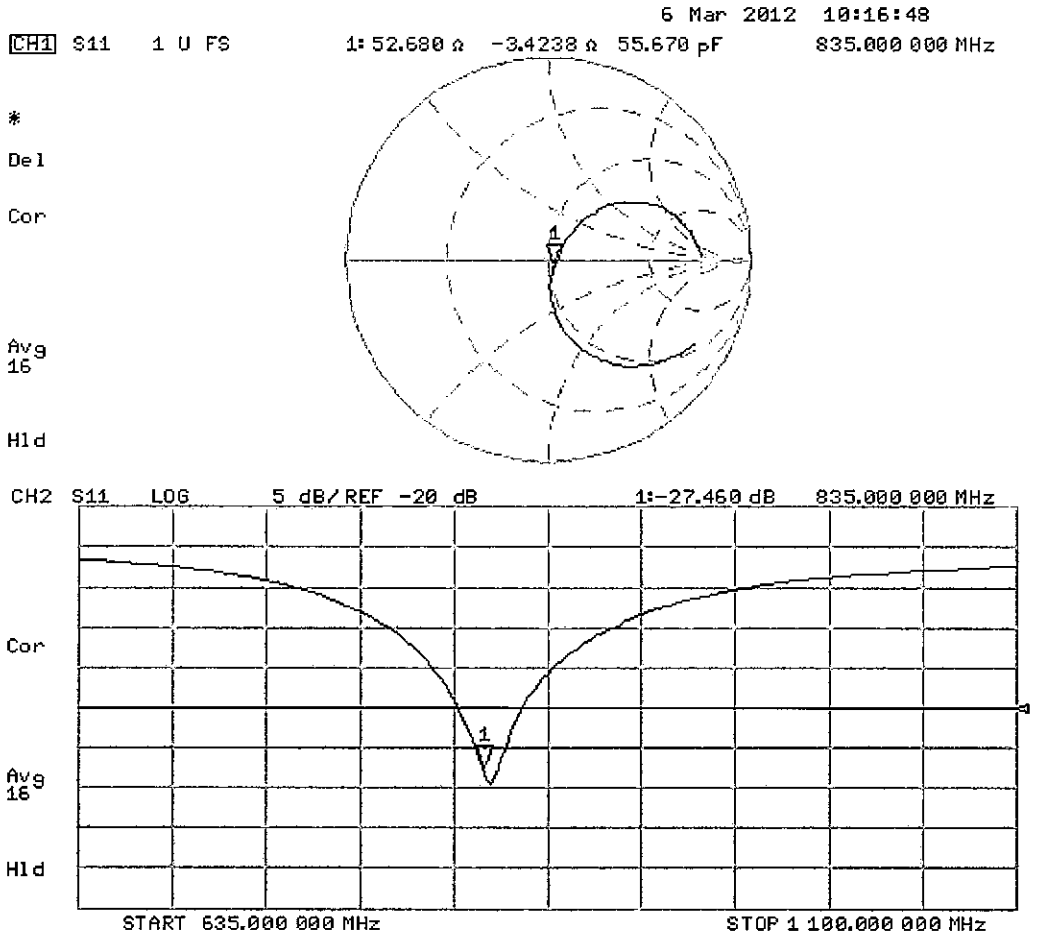
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.103 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.4310
SAR(1 g) = 2.32 mW/g; SAR(10 g) = 1.52 mW/g
Maximum value of SAR (measured) = 2.709 mW/g



0 dB = 2.710mW/g = 8.66 dB mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 05.03.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d005

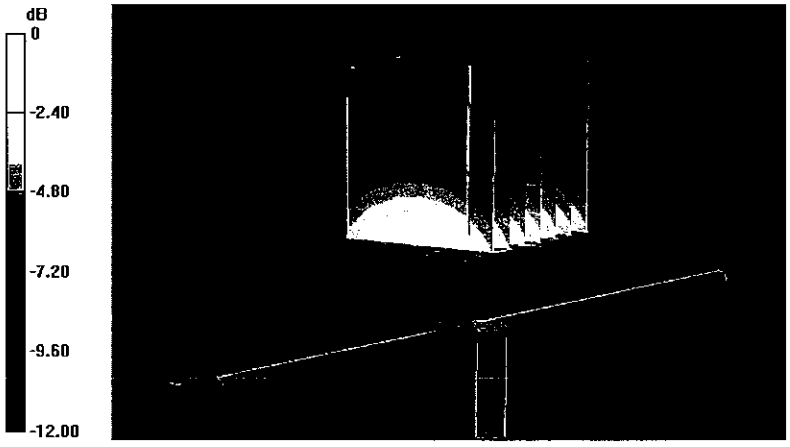
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 1 mho/m; ε_r = 55; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.02, 6.02, 6.02); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

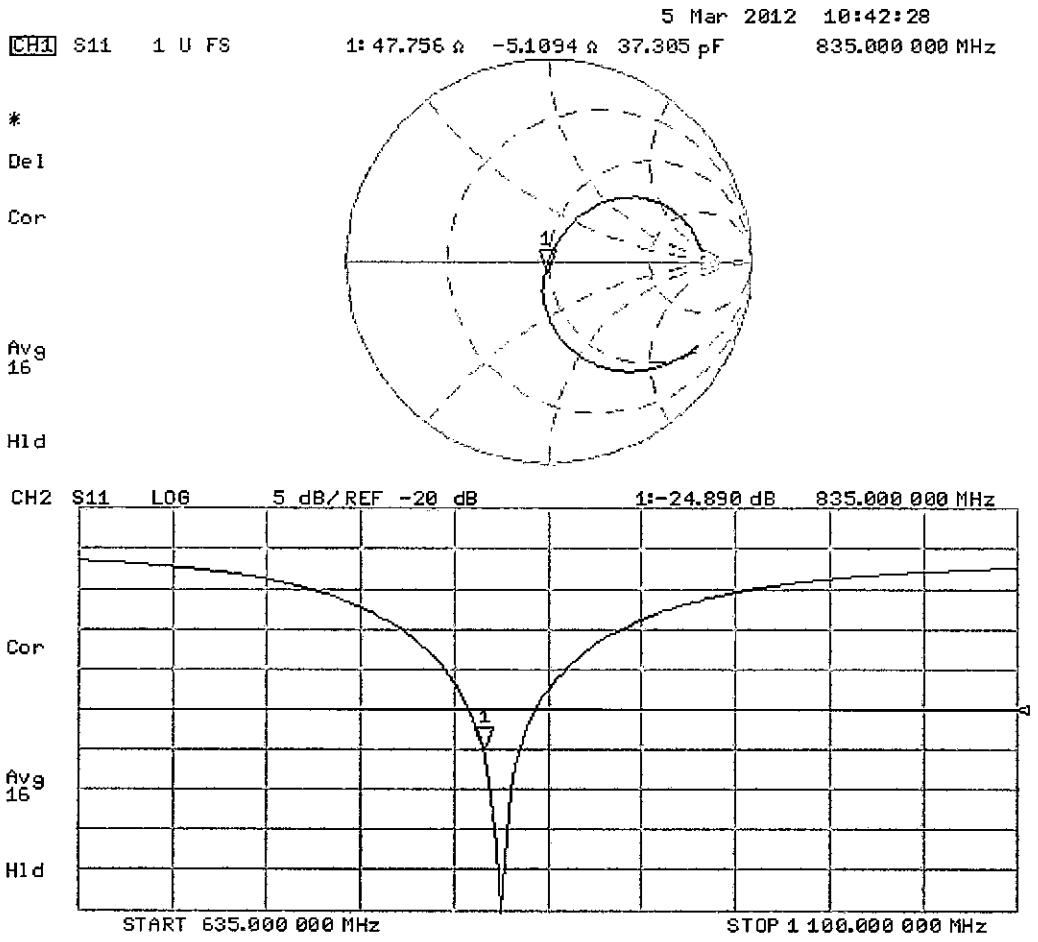
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.011 V/m; Power Drift = 0.0071 dB
Peak SAR (extrapolated) = 3.4950
SAR(1 g) = 2.42 mW/g; SAR(10 g) = 1.59 mW/g
Maximum value of SAR (measured) = 2.812 mW/g



0 dB = 2.810mW/g = 8.97 dB mW/g

Impedance Measurement Plot for Body TSL



Dipole D835V2 – SN: 4d005 Antenna Parameters

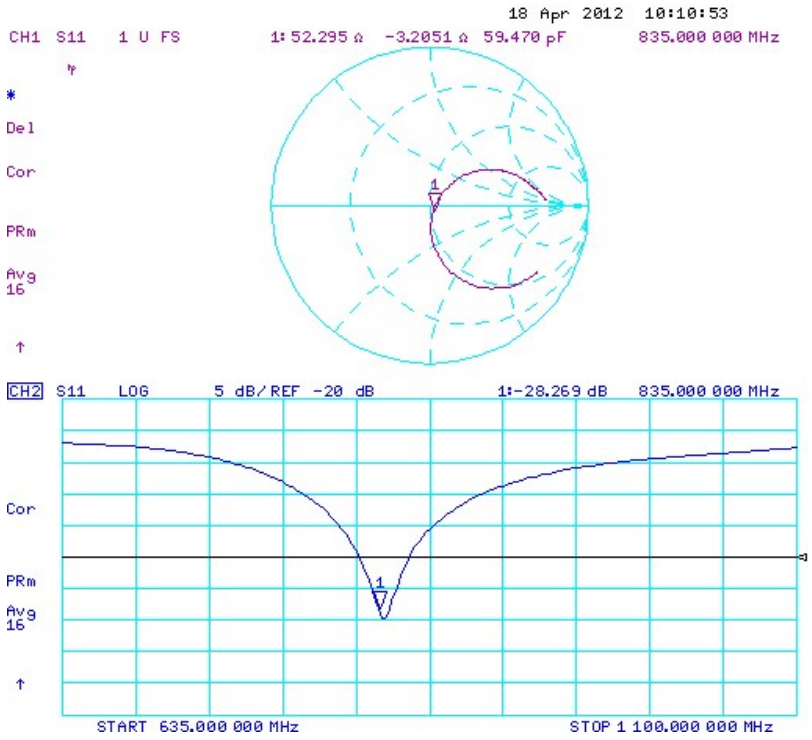
Antenna Parameters with Head TSL

	Calibration certificate	Annual measurement 2012-03-15
Impedance, transformed to feed point	52.7 Ω - 3.4 jΩ	52.3 Ω - 3.2 jΩ
Return loss	- 27.5 dB	- 28.3 dB

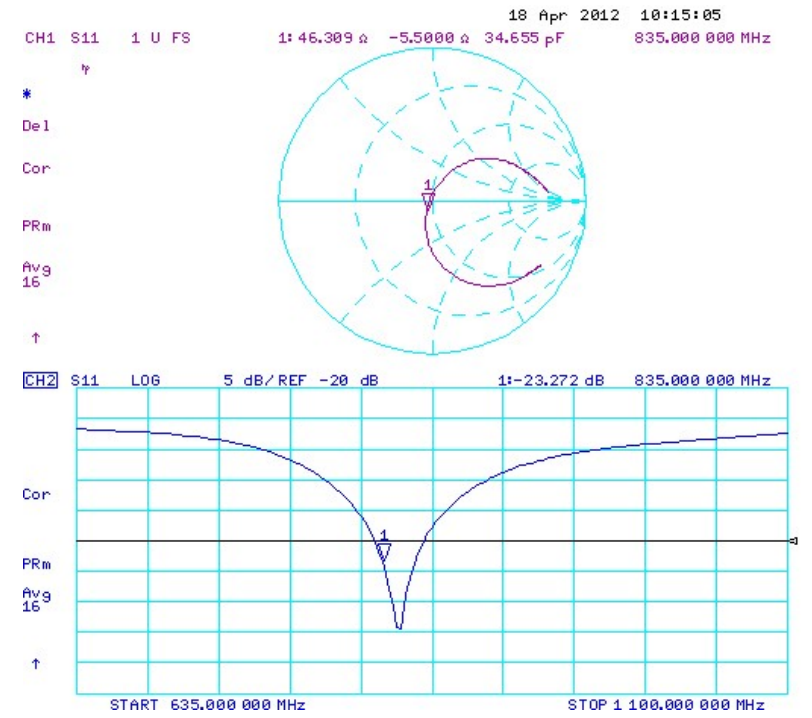
Antenna Parameters with Body TSL

	Calibration certificate	Annual measurement 2012-03-15
Impedance, transformed to feed point	47.8 Ω - 5.1 jΩ	46.3 Ω - 5.5 jΩ
Return loss	- 24.9 dB	- 23.3 dB

Impedance Measurement plot for Head TSL 835



Impedance Measurement plot for Body TSL 835



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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

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 Beijing TCC

Certificate No: D835V2-479_Mar11

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 479
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits
Calibration date:	March 9, 2011

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 ± 3)°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-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11

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-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 10, 2011

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.2 Ω - 3.3 jΩ
Return Loss	- 29.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.0 Ω - 5.2 jΩ
Return Loss	- 24.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.388 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 28, 2003

DASY5 Validation Report for Head TSL

Date/Time: 09.03.2011 14:54:54

Test Laboratory: SPEAG, Zurich, Switzerland

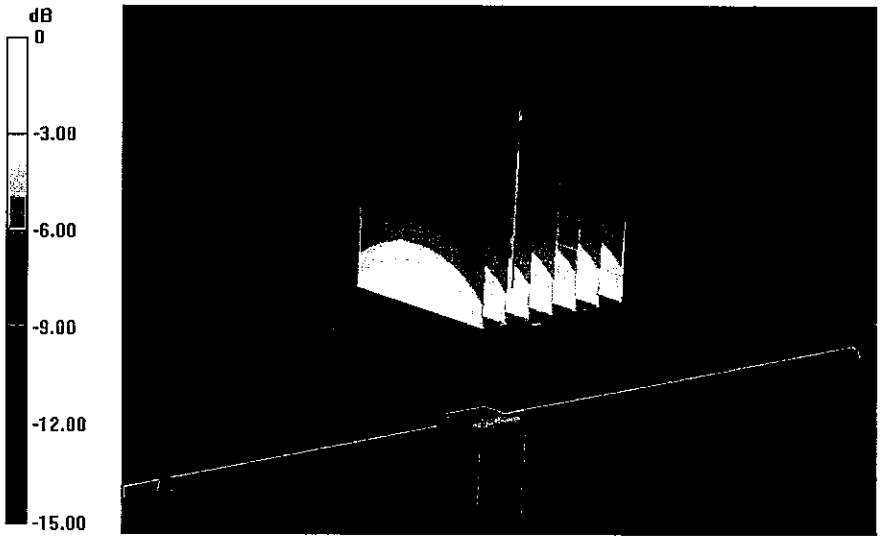
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:479

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL900
Medium parameters used: f = 835 MHz; σ = 0.89 mho/m; ε_r = 41; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

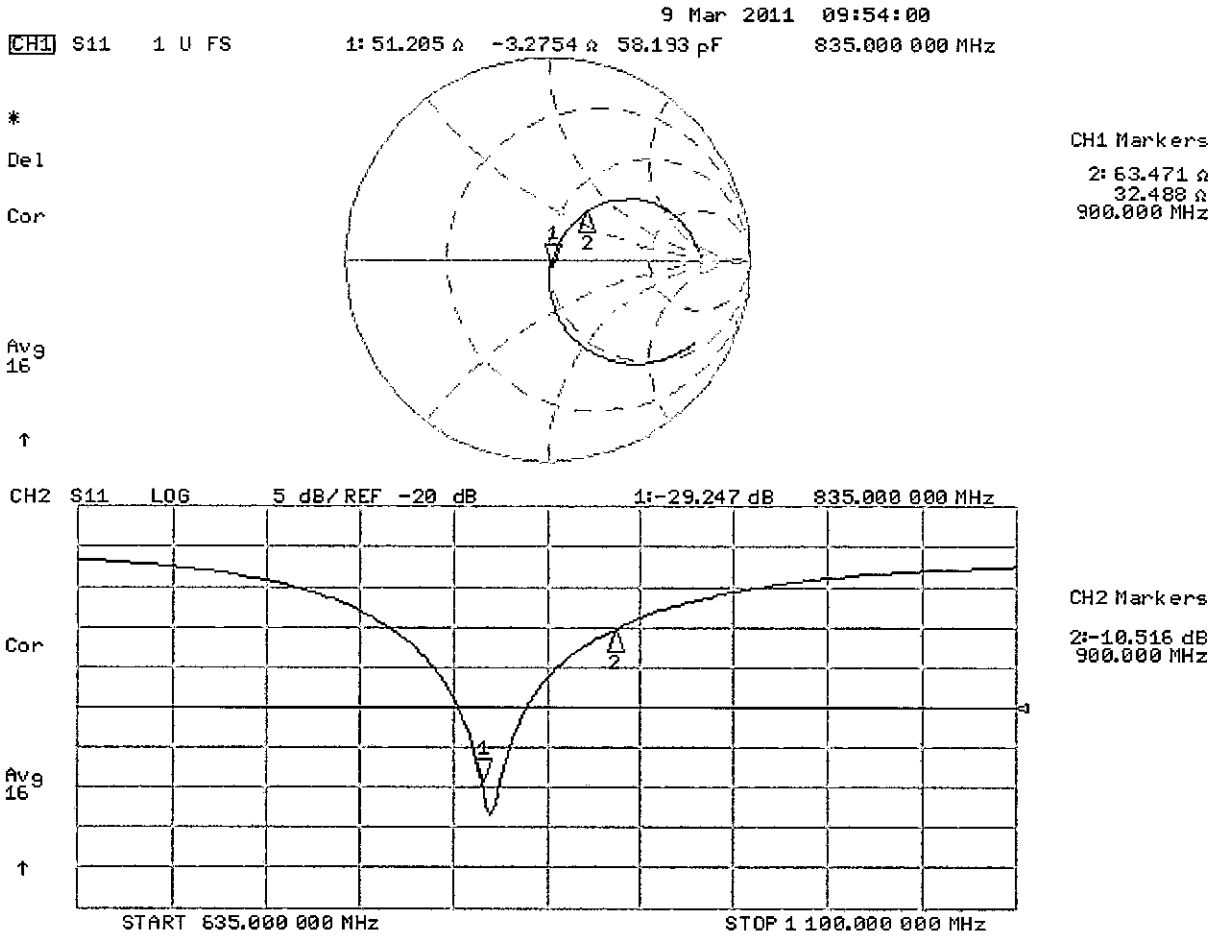
- Probe: ES3DV3 - SN3205; ConvF(6.03, 6.03, 6.03); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY52, V52.6 Build 2, Version 52.6.2 (424)
- Postprocessing SW: SEMCAD X, V14.4 Build 4, Version 14.4.4 (2829)

Head/d=15mm, Pin=250 mW, dist=3.0mm (ES-Probe) 2/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.436 V/m; Power Drift = 0.0071 dB
Peak SAR (extrapolated) = 3.602 W/kg
SAR(1 g) = 2.39 mW/g; SAR(10 g) = 1.56 mW/g
Maximum value of SAR (measured) = 2.795 mW/g



0 dB = 2.790mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 09.03.2011 10:34:32

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:479

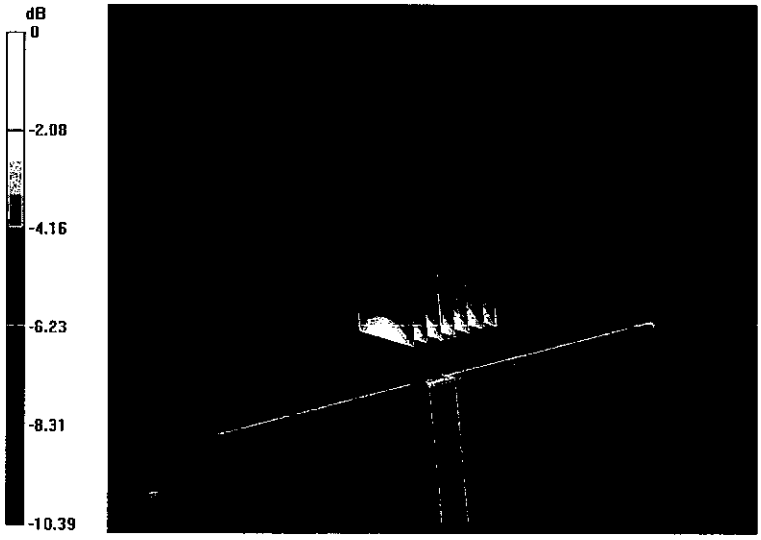
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: MSL900
Medium parameters used: f = 835 MHz; σ = 0.99 mho/m; ε_r = 54.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.86, 5.86, 5.86); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY52, V52.6 Build 2, Version 52.6.2 (424)
- Postprocessing SW: SEMCAD X, V14.4 Build 4, Version 14.4.4 (2829)

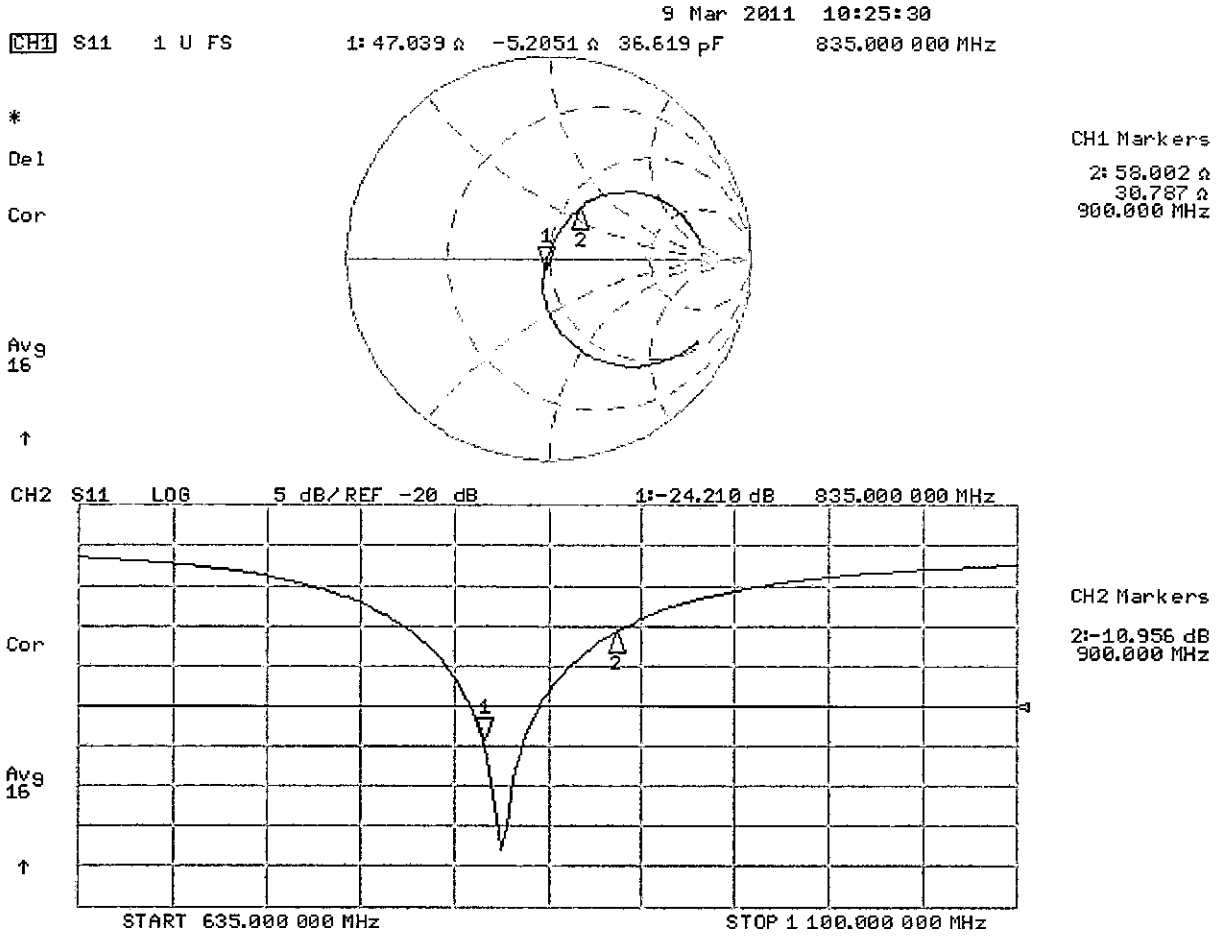
Body/d=15mm, Pin=250 mW, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.238 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 3.717 W/kg
SAR(1 g) = 2.52 mW/g; SAR(10 g) = 1.65 mW/g
Maximum value of SAR (measured) = 2.938 mW/g



0 dB = 2.940mW/g

Impedance Measurement Plot for Body TSL



Dipole D835V2 – SN: 479 Antenna Parameters

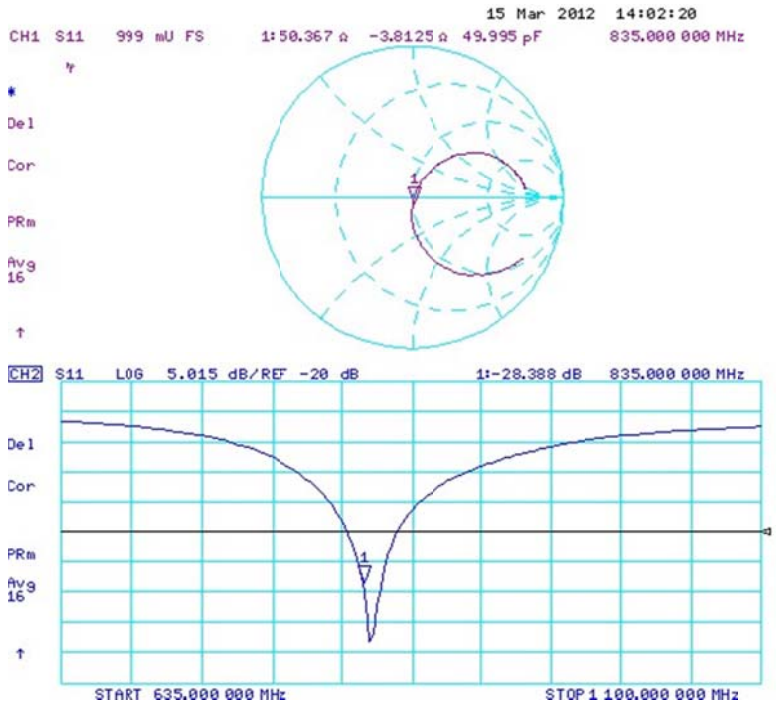
Antenna Parameters with Head TSL

	Calibration certificate	Annual measurement 2012-03-15
Impedance, transformed to feed point	51.2 Ω - 3.3 jΩ	50.4 Ω - 3.8 jΩ
Return loss	- 29.2 dB	- 28.4 dB

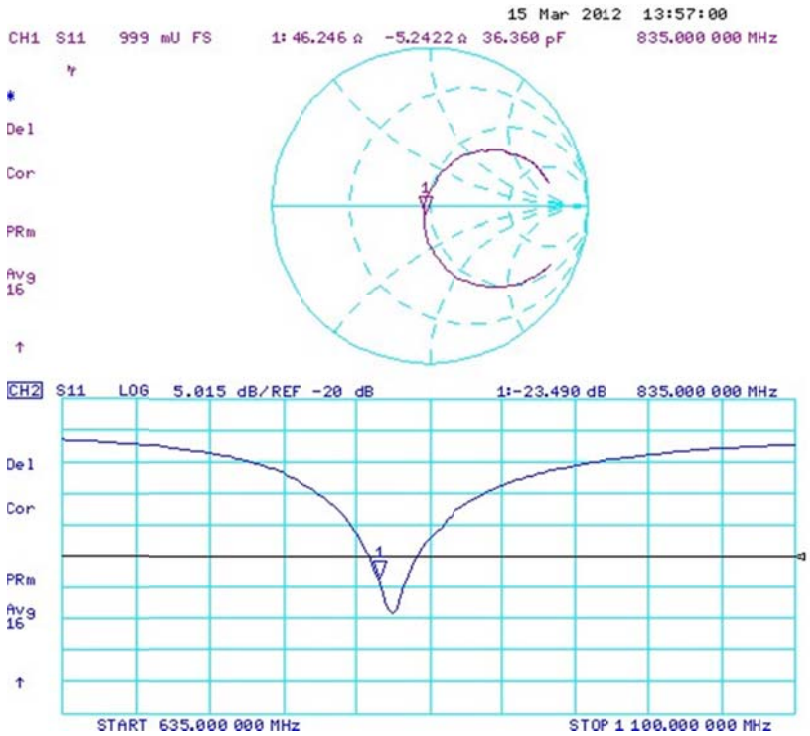
Antenna Parameters with Body TSL

	Calibration certificate	Annual measurement 2012-03-15
Impedance, transformed to feed point	47.0 Ω - 5.2 jΩ	46.2 Ω - 5.2 jΩ
Return loss	- 24.2 dB	- 23.5 dB

Impedance Measurement plot for Head TSL 835



Impedance Measurement plot for Body TSL 835



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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

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 Beijing TCC** Certificate No: **D1900V2-547_Oct11**

CALIBRATION CERTIFICATE

Object D1900V2 - SN: 547

Calibration procedure(s) QA CAL-05.v8
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: October 20, 2011

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 ± 3)°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	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5086 (20g)	29-Mar-11 (No. 217-01368)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	29-Apr-11 (No. ES3-3205_Apr11)	Apr-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 20, 2011

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.5 Ω + 4.3 jΩ
Return Loss	- 27.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.8 Ω + 3.5 jΩ
Return Loss	- 26.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.191 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Design Modification by End User

The dipole has been modified with Teflon Rings (TR) placed within identified markings close to the end of each dipole arm. Calibration has been performed with TR attached to the dipole.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	November 15, 2001

DASY5 Validation Report for Head TSL

Date: 20.10.2011

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 547

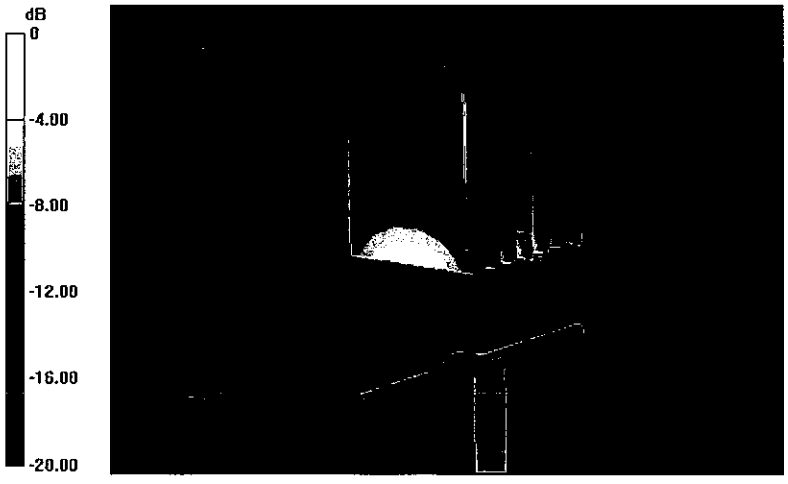
Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.43 mho/m; ε_r = 39.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.01, 5.01, 5.01); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

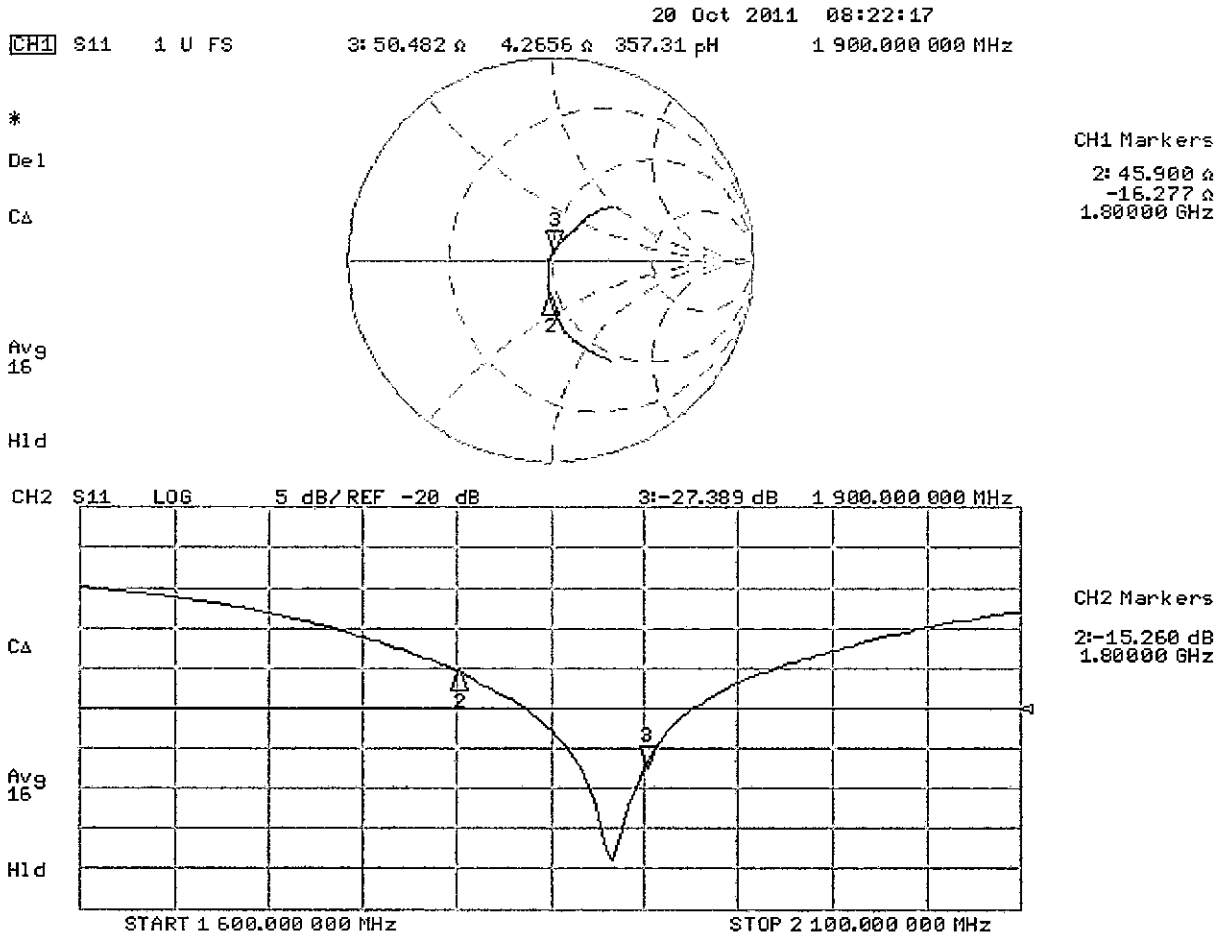
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 99.072 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 19.037 W/kg
SAR(1 g) = 10.4 mW/g; SAR(10 g) = 5.4 mW/g
Maximum value of SAR (measured) = 13.012 mW/g



0 dB = 13.010mW/g

Impedance Measurement Plot for Head TSL



Date: 18.10.2011

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 547

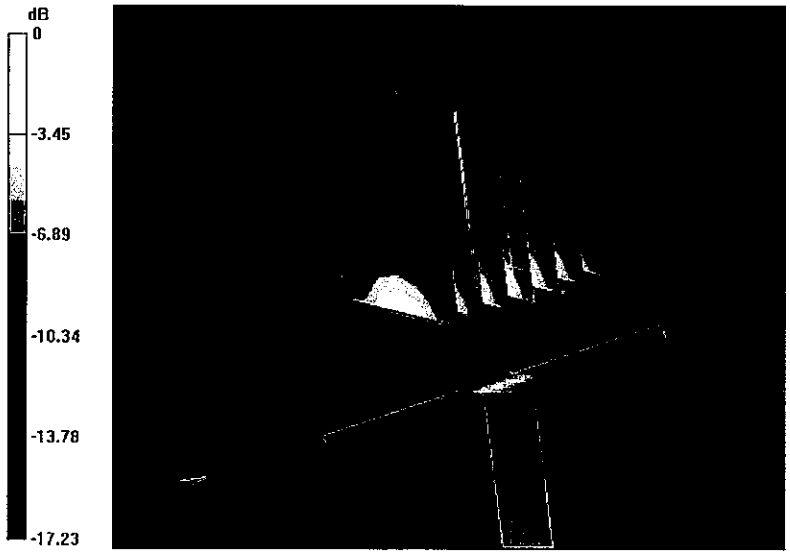
Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.59 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.62, 4.62, 4.62); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

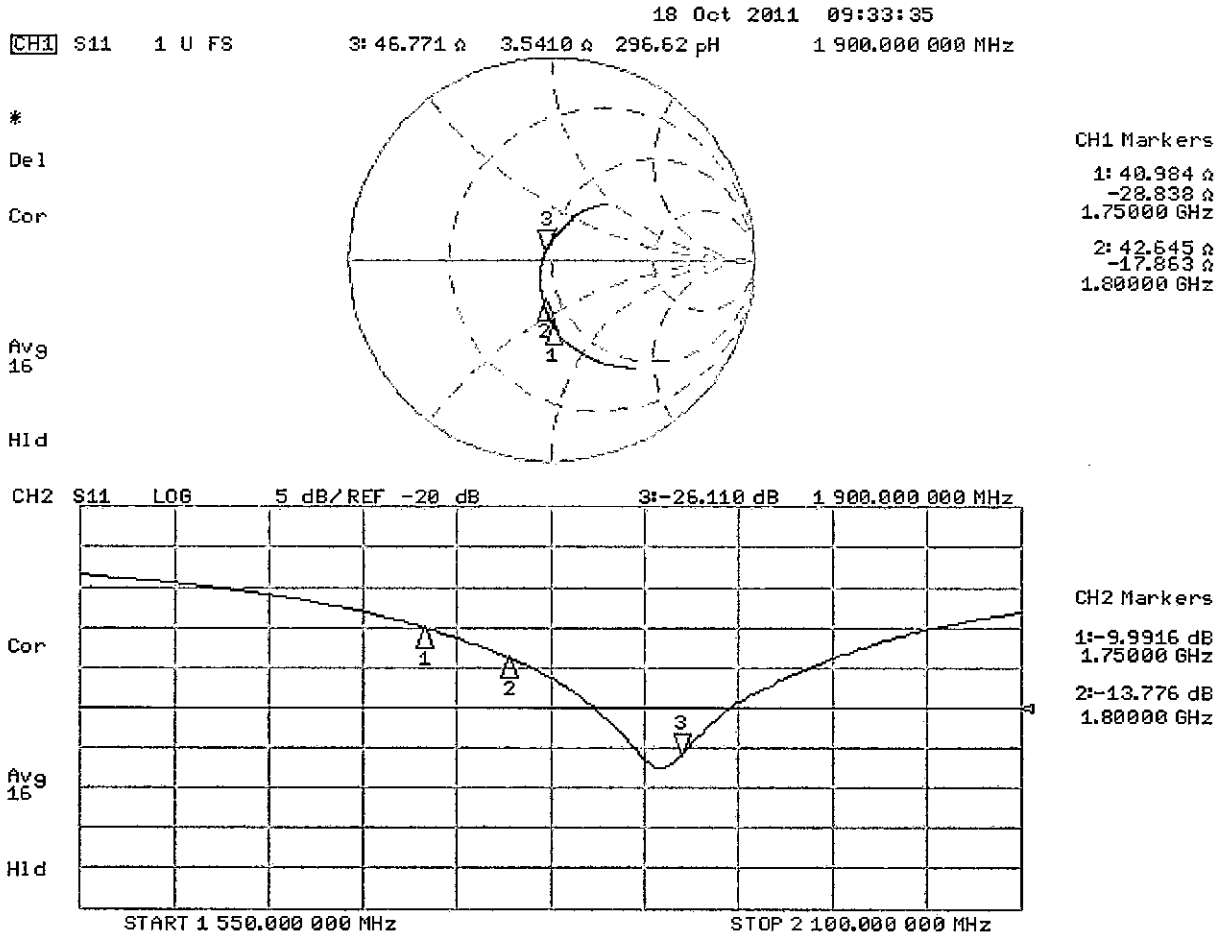
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.823 V/m; Power Drift = 0.0092 dB
Peak SAR (extrapolated) = 18.788 W/kg
SAR(1 g) = 10.6 mW/g; SAR(10 g) = 5.5 mW/g
Maximum value of SAR (measured) = 13.491 mW/g



0 dB = 13.490mW/g

Impedance Measurement Plot for Body TSL



Dipole D1900V2 – SN: 547 Antenna Parameters

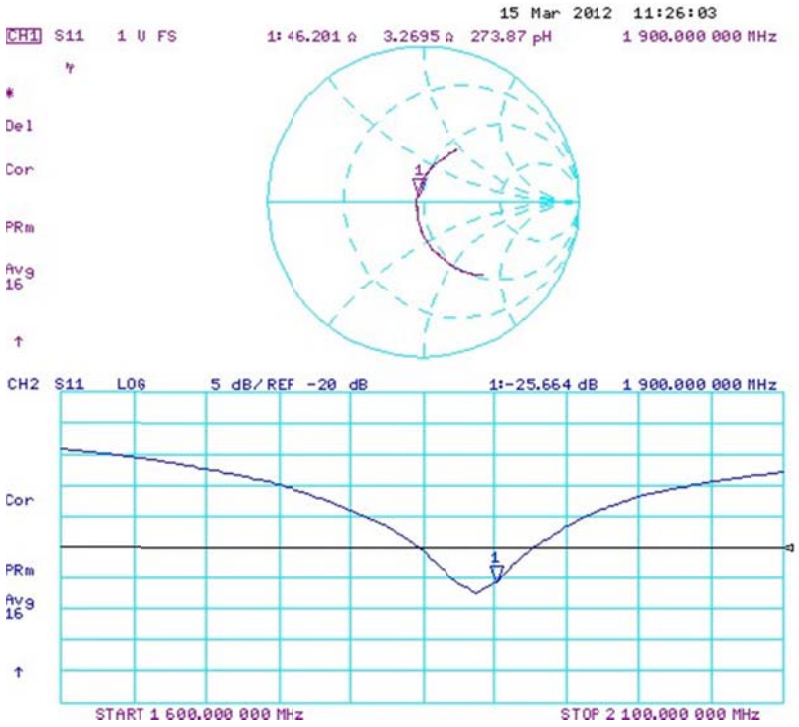
Antenna Parameters with Head TSL

	Calibration certificate	Annual measurement 2012-03-15
Impedance, transformed to feed point	50.5 Ω + 4.3 jΩ	46.2 Ω + 3.3 jΩ
Return loss	- 27.4 dB	- 25.7 dB

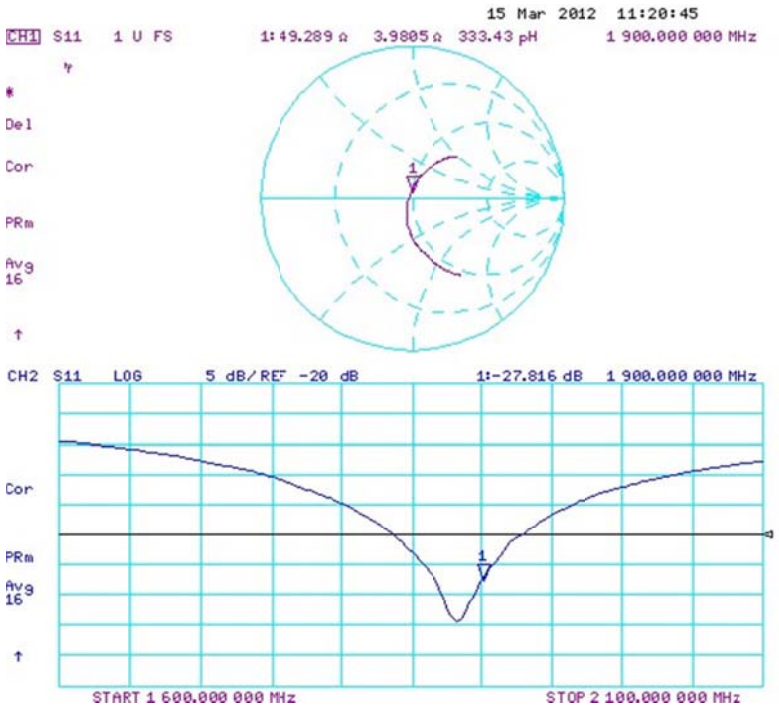
Antenna Parameters with Body TSL

	Calibration certificate	Annual measurement 2012-03-15
Impedance, transformed to feed point	46.8 Ω + 3.5 jΩ	49.2 Ω + 4.0 jΩ
Return loss	- 26.1 dB	- 27.8 dB

Impedance Measurement plot for Head TSL 1900



Impedance Measurement plot for Body TSL 1900



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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

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 Beijing TCC

Certificate No: D2450V2-883_Feb12

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 883
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	February 23, 2012

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 ± 3)°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	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5086 (20g)	29-Mar-11 (No. 217-01368)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	Israe El-Naouq
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 23, 2012

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.1 Ω - 0.4 jΩ
Return Loss	- 28.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.4 Ω + 1.0 jΩ
Return Loss	- 39.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.165 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	October 06, 2011

DASY5 Validation Report for Head TSL

Date: 23.02.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 883

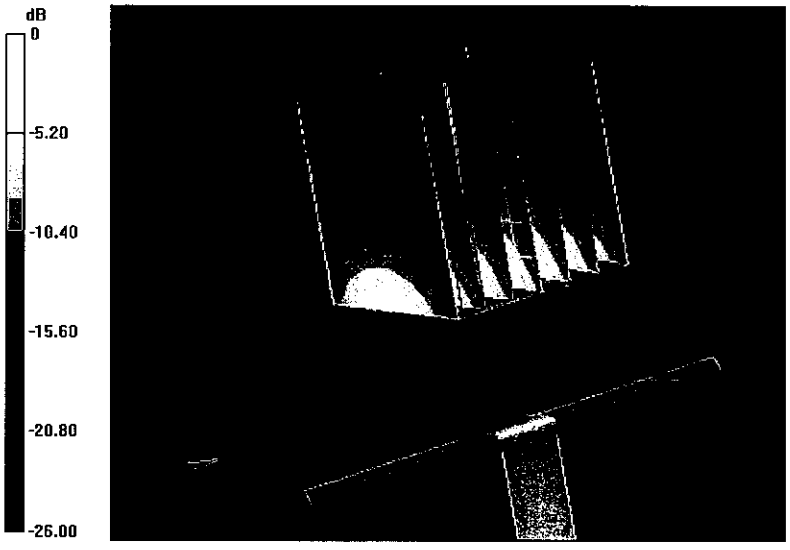
Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.86 mho/m; ε_r = 38.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

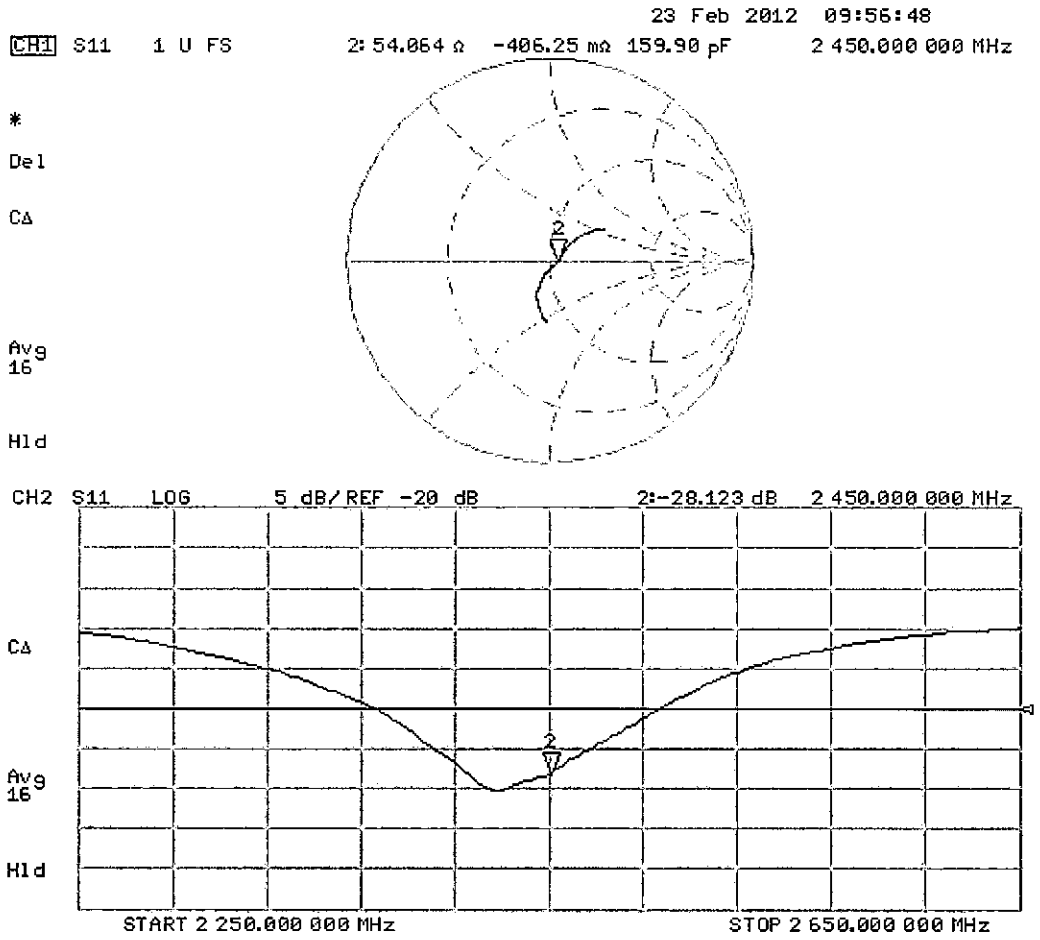
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 100.8 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 28.8960
SAR(1 g) = 13.8 mW/g; SAR(10 g) = 6.36 mW/g
Maximum value of SAR (measured) = 17.788 mW/g



0 dB = 17.790mW/g = 25.00 dB mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 23.02.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 883

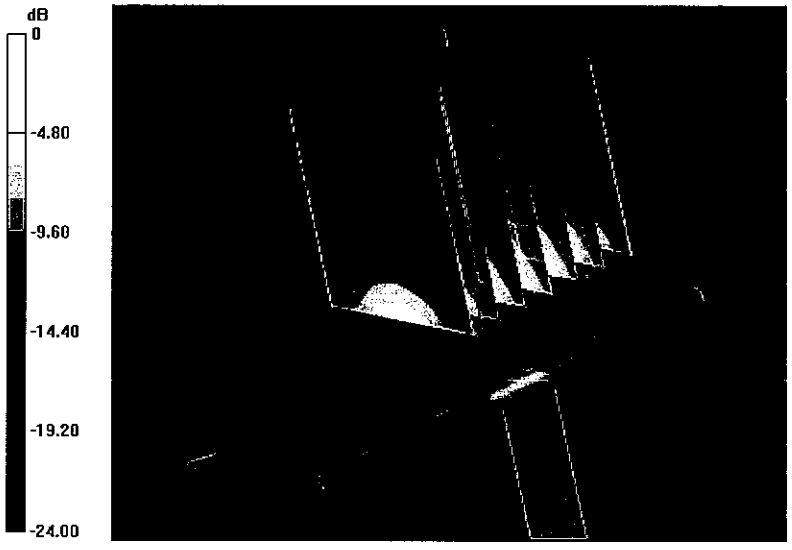
Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.02 mho/m; ε_r = 52.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.26, 4.26, 4.26); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

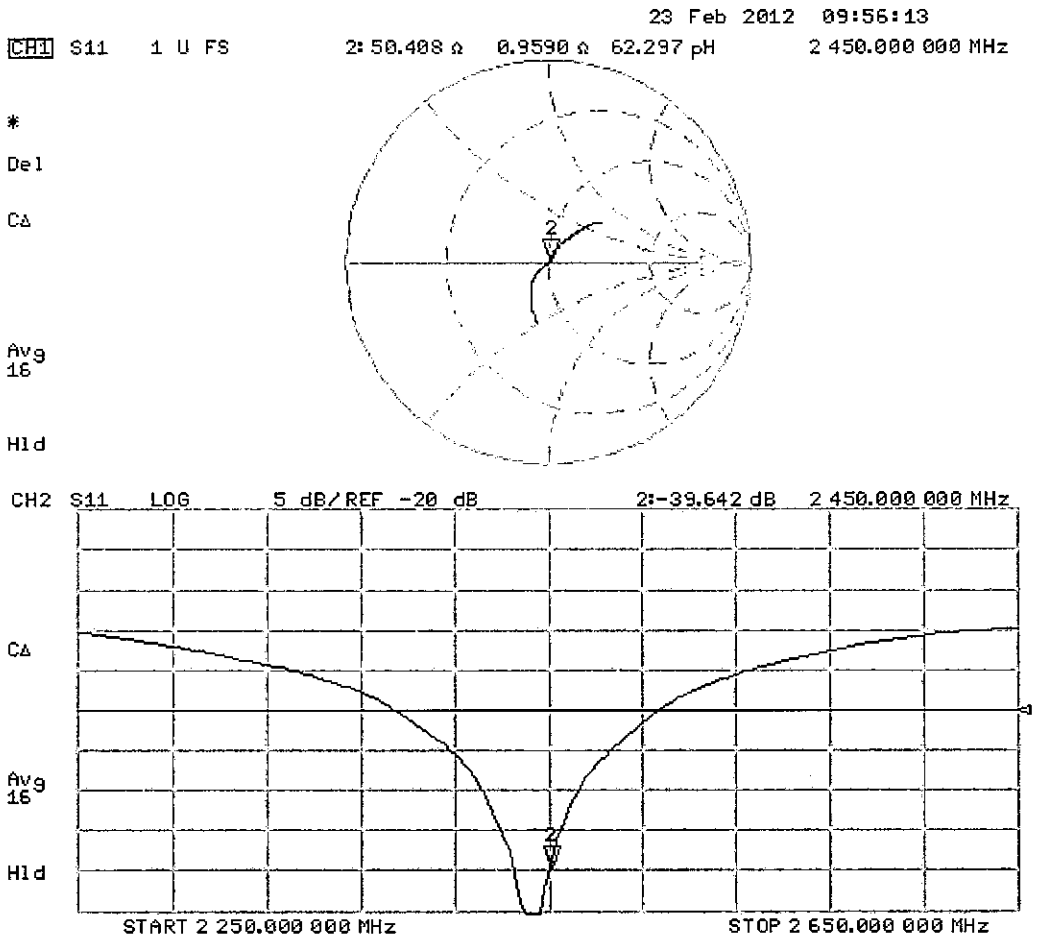
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.084 V/m; Power Drift = -0.00038 dB
Peak SAR (extrapolated) = 26.9170
SAR(1 g) = 13.2 mW/g; SAR(10 g) = 6.12 mW/g
Maximum value of SAR (measured) = 17.333 mW/g



0 dB = 17.330mW/g = 24.78 dB mW/g

Impedance Measurement Plot for Body TSL



Dipole D2450V2 – SN: 883 Antenna Parameters

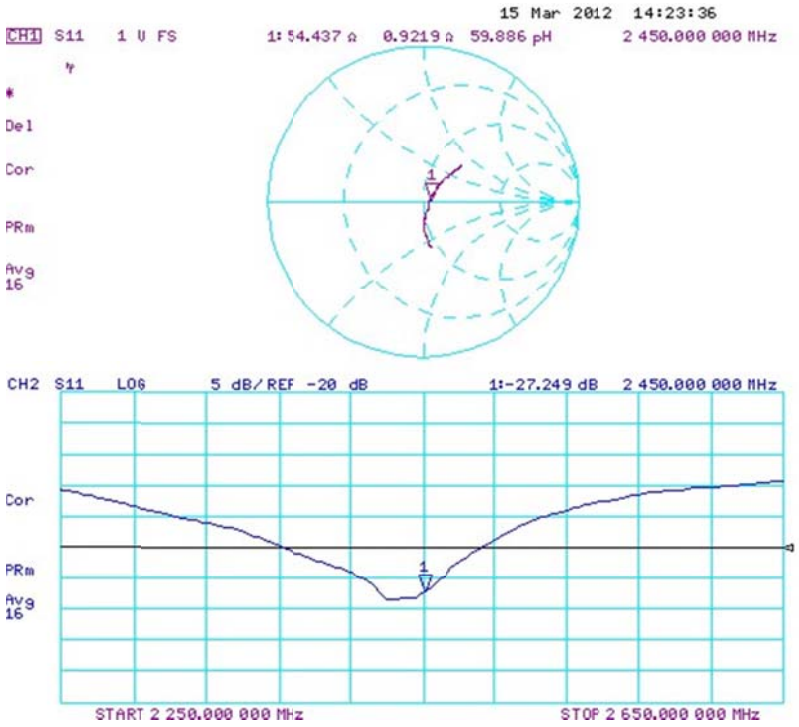
Antenna Parameters with Head TSL

	Calibration certificate	Annual measurement 2012-03-15
Impedance, transformed to feed point	54.1 Ω - 0.4 jΩ	54.4 Ω + 0.9 jΩ
Return loss	- 28.1 dB	- 27.2 dB

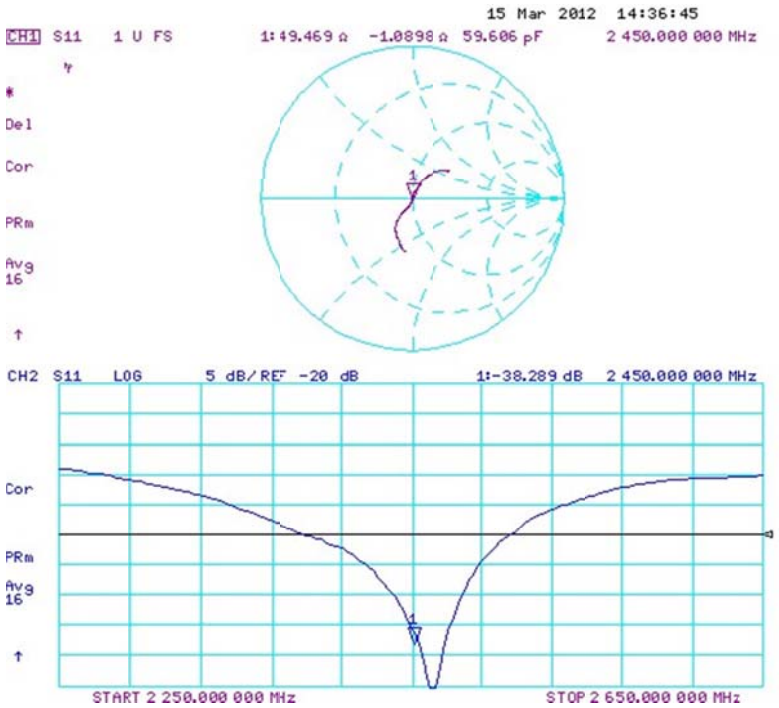
Antenna Parameters with Body TSL

	Calibration certificate	Annual measurement 2012-03-15
Impedance, transformed to feed point	50.4 Ω + 1.0 jΩ	49.5 Ω - 1.1 jΩ
Return loss	- 39.6 dB	- 38.3 dB

Impedance Measurement plot for Head TSL 2450



Impedance Measurement plot for Body TSL 2450



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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

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 Beijing TCC**

Certificate No: D2450V2-760_Mar11

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 760
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits
Calibration date:	March 17, 2011

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 ± 3)°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-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11

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-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 17, 2011

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	55.3 Ω + 2.7 jΩ
Return Loss	- 25.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.3 Ω + 5.6 jΩ
Return Loss	- 25.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.159 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	April 22, 2004

DASY5 Validation Report for Head TSL

Date/Time: 17.03.2011 12:48:58

Test Laboratory: SPEAG, Zurich, Switzerland

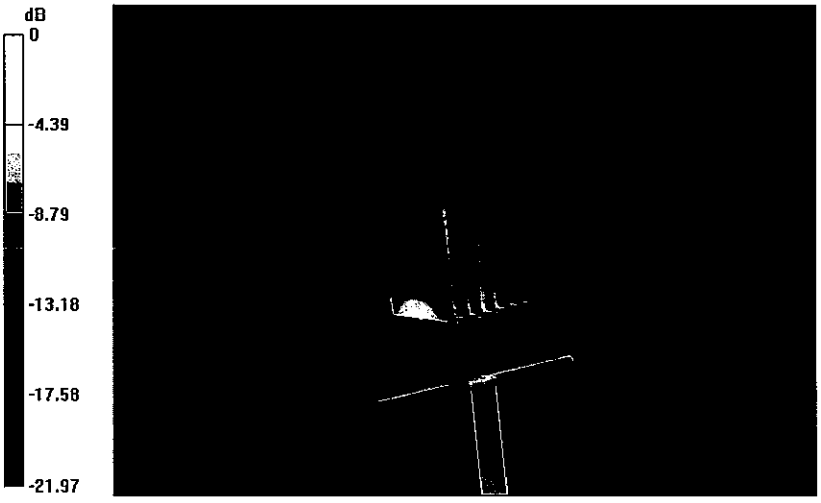
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:760

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL U12 BB
Medium parameters used: f = 2450 MHz; σ = 1.72 mho/m; ε_r = 38.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

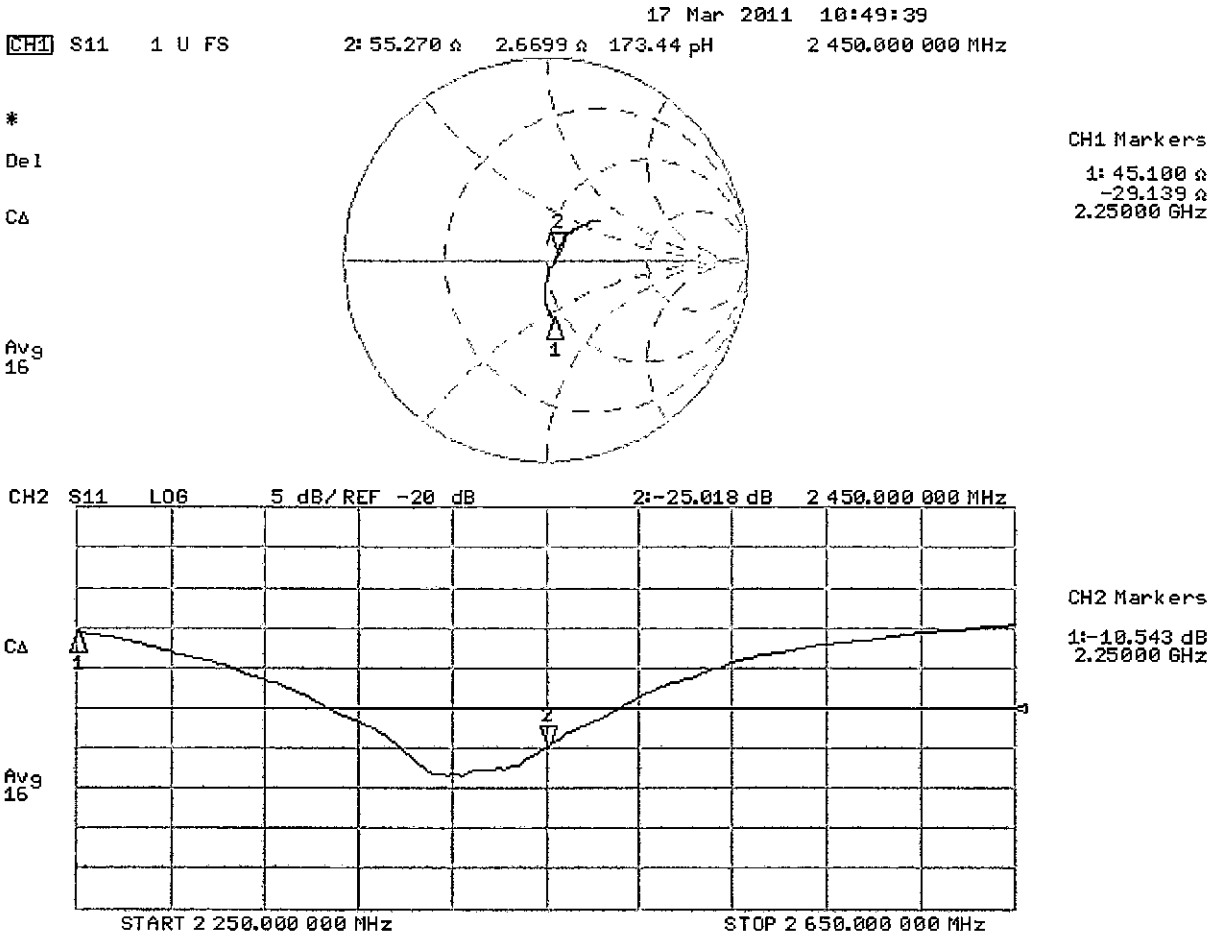
- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.4 Build (2829)

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 = 101.2 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 27.253 W/kg
SAR(1 g) = 13.3 mW/g; SAR(10 g) = 6.25 mW/g
Maximum value of SAR (measured) = 17.126 mW/g



0 dB = 17.130mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 08.03.2011 14:08:11

Test Laboratory: SPEAG, Zurich, Switzerland

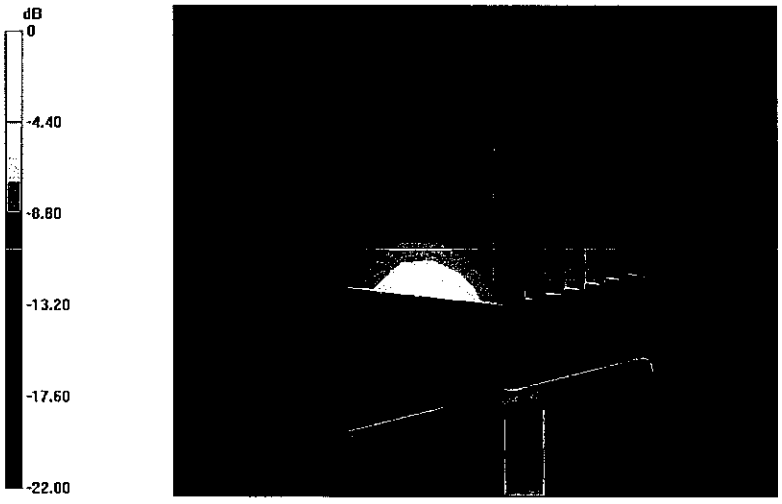
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:760

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: MSL U12 BB
Medium parameters used: f = 2450 MHz; σ = 1.93 mho/m; ε_r = 51.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

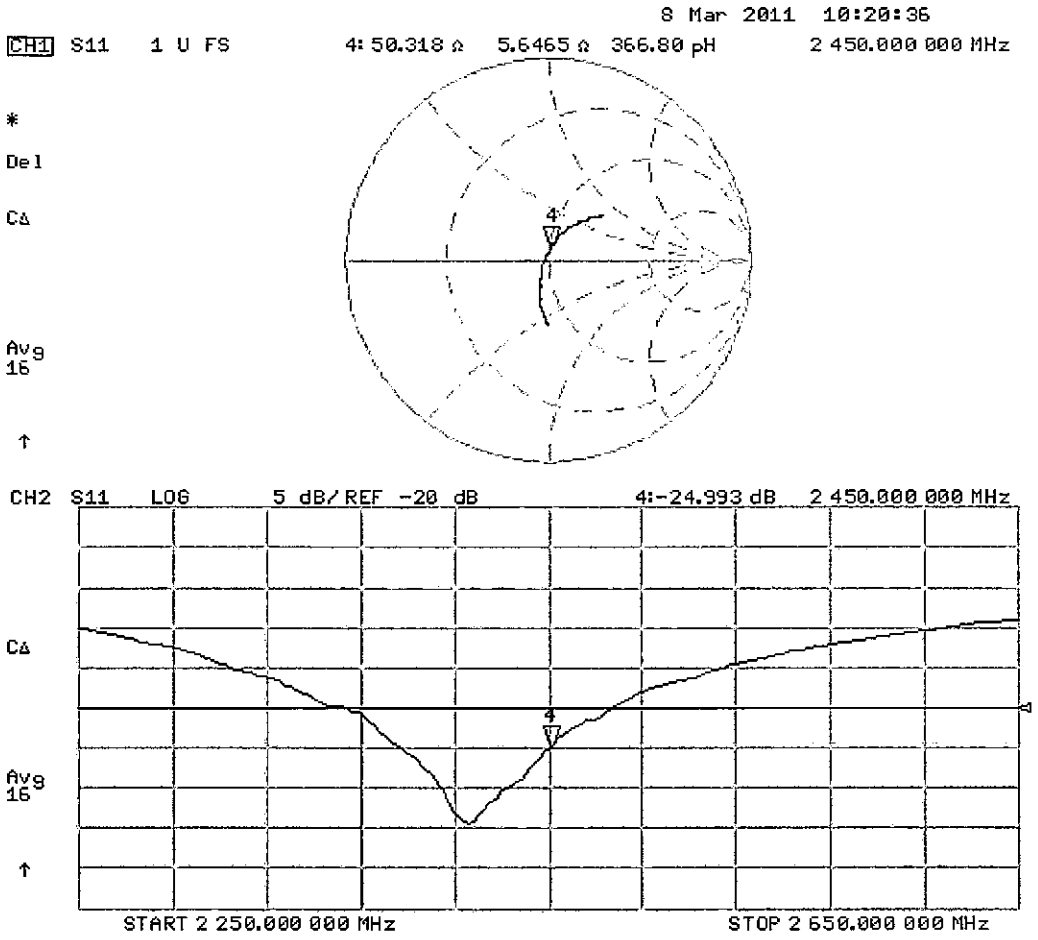
- Probe: ES3DV3 - SN3205; ConvF(4.31, 4.31, 4.31); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.4 Build (2829)

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 = 97.844 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 27.853 W/kg
SAR(1 g) = 13.3 mW/g; SAR(10 g) = 6.14 mW/g
Maximum value of SAR (measured) = 17.439 mW/g



0 dB = 17.440mW/g

Impedance Measurement Plot for Body TSL



Dipole D2450V2 – SN: 760 Antenna Parameters

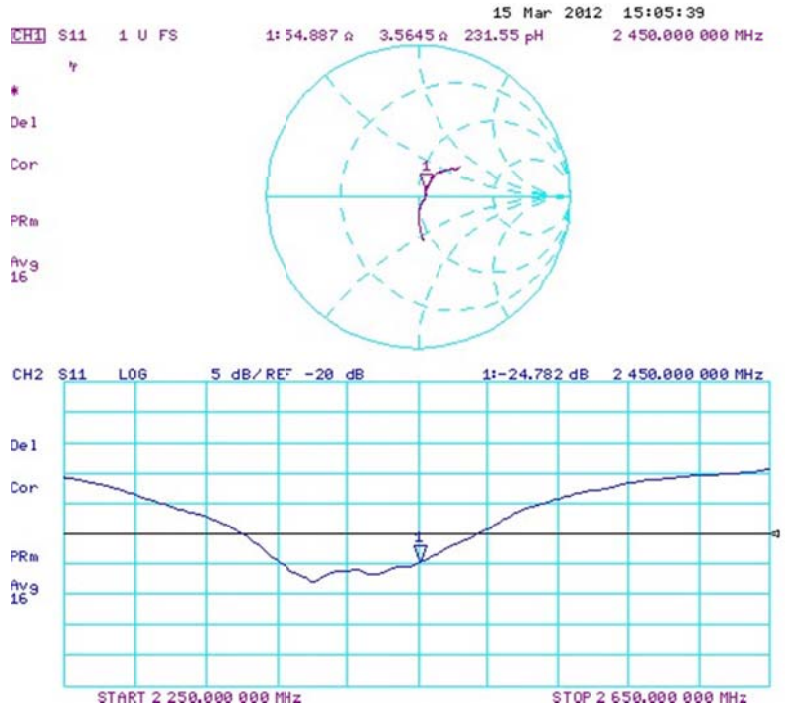
Antenna Parameters with Head TSL

	Calibration certificate	Annual measurement 2012-03-15
Impedance, transformed to feed point	55.3 Ω + 2.7 jΩ	54.9 Ω + 3.6 jΩ
Return loss	- 25.0 dB	- 24.8 dB

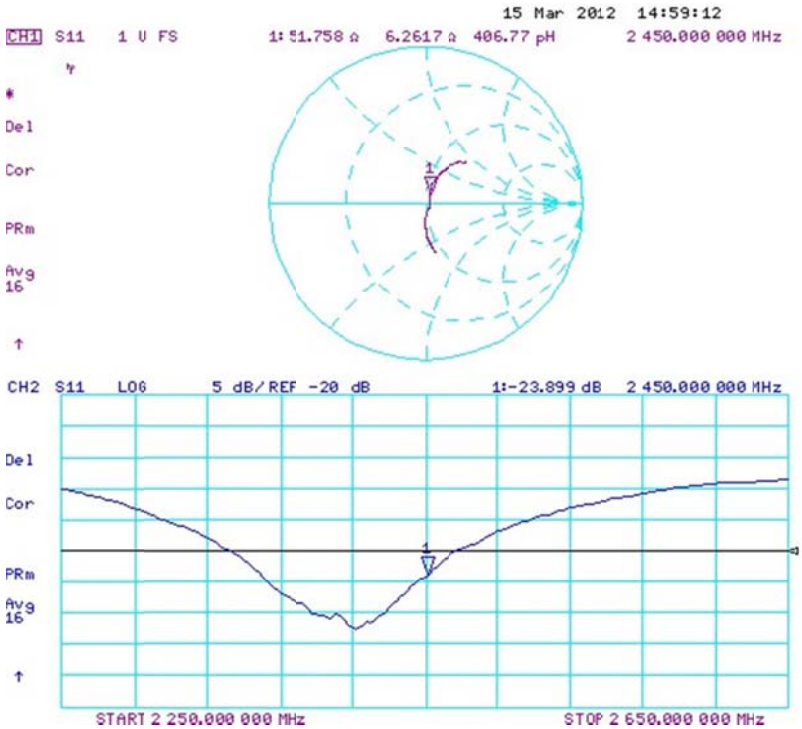
Antenna Parameters with Body TSL

	Calibration certificate	Annual measurement 2012-03-15
Impedance, transformed to feed point	50.3 Ω + 5.6 jΩ	51.8 Ω + 6.3 jΩ
Return loss	- 25.0 dB	- 23.9 dB

Impedance Measurement plot for Head TSL 2450



Impedance Measurement plot for Body TSL 2450



APPENDIX F: CONDUCTED POWER MEASUREMENTS FOR SUPPORTED GSM/GPRS TRANSMISSION MODES

F.1 Power Tuning Targets for Head and Body-worn measurements

GSM 850			
Slot configuration	Low channel	Mid channel	High channel
GSM 1-slot	32.5	32.5	32.5
GPRS 2-slot	29.5	29.5	29.5
GPRS 3-slot	27.7	27.7	27.7
GPRS 4-slot	26.5	26.5	26.5
EGRPS 1-slot	-	-	-
EGPRS 2-slot	-	-	-
EGPRS 3-slot	-	-	-
EGPRS 4-slot	-	-	-

GSM 1900			
Slot configuration	Low channel	Mid channel	High channel
GSM 1-slot	30.5	30.5	30.5
GPRS 2-slot	27.5	27.5	27.5
GPRS 3-slot	25.7	25.7	25.7
GPRS 4-slot	24.5	24.5	24.5
EGRPS 1-slot	-	-	-
EGPRS 2-slot	-	-	-
EGPRS 3-slot	-	-	-
EGPRS 4-slot	-	-	-

F.2 Conducted Power from the Samples used in the Testing

Type: RM-900; Serial number: 004402/47/128607/4 used for GSM/GPRS850 SAR Head and Body-worn measurements.

GSM 850			
Slot configuration	Low channel	Mid channel	High channel
GSM 1-slot	32.98	32.90	32.89
GPRS 2-slot	29.98	29.93	29.90
GPRS 3-slot	28.19	28.14	28.11
GPRS 4-slot	26.98	26.97	26.97
EGRPS 1-slot	-	-	-
EGPRS 2-slot	-	-	-
EGPRS 3-slot	-	-	-
EGPRS 4-slot	-	-	-

Type: RM-900; Serial number: 004402/47/128607/4 used for GSM/GPRS1900 SAR Head and Body-worn measurements.

GSM 1900			
Slot configuration	Low channel	Mid channel	High channel
GSM 1-slot	31.15	31.11	31.04
GPRS 2-slot	28.11	28.16	28.2
GPRS 3-slot	26.43	26.55	26.57
GPRS 4-slot	25.37	25.52	25.47
EGRPS 1-slot	-	-	-
EGPRS 2-slot	-	-	-
EGPRS 3-slot	-	-	-
EGPRS 4-slot	-	-	-

APPENDIX G: CONDUCTED POWER MEASUREMENTS FOR WLAN

G.1 Power Tuning Targets

Tuning Targets					
Modulation mode	Ch 1	Ch 2	Ch 6	Ch 10	Ch 11
b-mode WLAN DSSS 1 Mbps	15.00	-	15.00	-	15.00
b-mode WLAN DSSS 2 Mbps	15.00	-	15.00	-	15.00
b-mode WLAN DSSS 5.5 Mbps	15.00	-	15.00	-	15.00
b-mode WLAN DSSS 11 Mbps	15.00	-	15.00	-	15.00
g-mode WLAN OFDM 6 Mbps	11.00	-	13.00	-	12.50
g-mode WLAN OFDM 9 Mbps	11.00	-	13.00	-	12.50
g-mode WLAN OFDM 12 Mbps	11.00	-	13.00	-	12.50
g-mode WLAN OFDM 18 Mbps	11.00	-	13.00	-	12.50
g-mode WLAN OFDM 24 Mbps	11.00	-	13.00	-	12.50
g-mode WLAN OFDM 36 Mbps	11.00	-	13.00	-	12.50
g-mode WLAN OFDM 48 Mbps	11.00	-	13.00	-	12.50
g-mode WLAN OFDM 54 Mbps	11.00	-	13.00	-	12.50
n-mode MCS 0: OFDM 6.5 / 7.25 Mbps	11.00	-	12.00	-	11.50
n-mode MCS 1: OFDM 13.0 / 14.4 Mbps	11.00	-	12.00	-	11.50
n-mode MCS 2: OFDM 19.5 / 21.7 Mbps	11.00	-	12.00	-	11.50
n-mode MCS 3: OFDM 26.0 / 28.9 Mbps	11.00	-	12.00	-	11.50
n-mode MCS 4: OFDM 39.0 / 43.3 Mbps	11.00	-	12.00	-	11.50
n-mode MCS 5: OFDM 52.0 / 57.8 Mbps	11.00	-	12.00	-	11.50
n-mode MCS 6: OFDM 58.5 / 65.0 Mbps	11.00	-	12.00	-	11.50
n-mode MCS 7: OFDM 65.0 / 72.2 Mbps	11.00	-	12.00	-	11.50

G.2 Conducted Power measurements

Type: RM-900; Serial number: 004402/47/128598/5 used for WLAN for SAR Head, Body-worn and Wireless Router measurements.

WLAN 2.4 GHz					
Modulation mode	Ch 1	Ch 2	Ch 6	Ch 10	Ch 11
b-mode WLAN DSSS 1 Mbps	16.27	-	15.64	-	16.30
b-mode WLAN DSSS 2 Mbps	16.13	-	15.35	-	15.99
b-mode WLAN DSSS 5.5 Mbps	16.12	-	15.39	-	16.32
b-mode WLAN DSSS 11 Mbps	16.14	-	15.97	-	16.31
g-mode WLAN OFDM 6 Mbps	12.06	-	15.42	-	13.62
g-mode WLAN OFDM 9 Mbps	12.36	-	15.57	-	13.61
g-mode WLAN OFDM 12 Mbps	12.49	-	15.51	-	13.67
g-mode WLAN OFDM 18 Mbps	12.63	-	15.44	-	13.46
g-mode WLAN OFDM 24 Mbps	12.48	-	13.88	-	13.63
g-mode WLAN OFDM 36 Mbps	12.22	-	13.83	-	13.85
g-mode WLAN OFDM 48 Mbps	12.49	-	15.36	-	13.68
g-mode WLAN OFDM 54 Mbps	12.27	-	15.66	-	13.46
n-mode MCS 0: OFDM 6.5 / 7.25 Mbps	12.33	-	13.73	-	13.72
n-mode MCS 1: OFDM 13.0 / 14.4 Mbps	12.29	-	13.83	-	13.61
n-mode MCS 2: OFDM 19.5 / 21.7 Mbps	12.23	-	13.87	-	13.76
n-mode MCS 3: OFDM 26.0 / 28.9 Mbps	12.00	-	13.94	-	13.57
n-mode MCS 4: OFDM 39.0 / 43.3 Mbps	12.22	-	13.52	-	13.73
n-mode MCS 5: OFDM 52.0 / 57.8 Mbps	12.56	-	13.71	-	13.44
n-mode MCS 6: OFDM 58.5 / 65.0 Mbps	12.39	-	13.63	-	13.54
n-mode MCS 7: OFDM 65.0 / 72.2 Mbps	12.35	-	12.24	-	12.66