TCC
Nokia

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

SAR Compliance Test Report

Test report no.:	FCC_RM-840_03	**Date of report:**	2012-12-20
Template version:	19.3	**Number of pages:**	41
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Measurements made by:	Liu Xianchao		
Tested device:	RM-840		
FCC ID:	QTLRM-840	**IC:**	-
Supplement reports:	SAR_Photo_RM-840_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:

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1. SUMMARY OF SAR TEST REPORT

1.1 Test Details

Period of test	2012-12-11 to 2012-12-18
SN, HW and SW numbers of tested device	SN: 004402/47/186434/2, HW: 0301, SW: BusECL3G_12w47.S, DUT: 52896
Batteries used in testing	BL-4U, DUT: 52886, 52885, 52887
Headsets used in testing	WH-109, DUT: 52888
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	32.93 dBm	Right, Cheek	0.643 W/kg	**0.72 W/kg**	1.6 W/kg	PASSED	1
GSM1900	512 / 1850.2	30.92 dBm	Left, Cheek	1.12 W/kg	**1.25 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#
2-slot GPRS850	128 / 824.2	29.87 dBm	1.5cm	0.874 W/kg	**0.98 W/kg**	1.6 W/kg	PASSED	3
4-slot GPRS1900	512 / 1850.2	24.88 dBm	1.5cm	0.621 W/kg	**0.70 W/kg**	1.6 W/kg	PASSED	4

* 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	1.25W/kg	-	-
{Max + Max} Simultaneous Head SAR value	1.57W/kg**		
Maximum Body SAR values	0.98W/kg	-	-
{Max + Max} Simultaneous Body SAR value	1.09W/kg**		
Maximum Product Specific (Wireless Router) SAR values	-	-	-
Maximum Simultaneous SAR value head SAR: GSM1900 + BT2450**	1.57**		

**Max+Max values include estimated BT SAR as calculated according to KDB 447498 General RF Exposure Guidelines D01 v05 Section 4.3.2.

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	0.49dB

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	7.00				8.50			

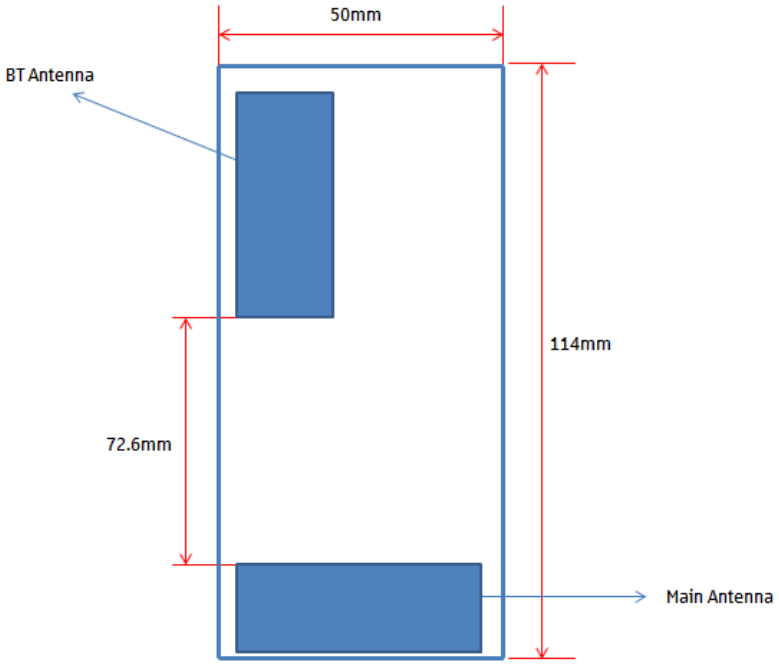
Outside of USA and Canada, the transmitter of the device is capable of operating also in GSM/GPRS/EGPRS900, GSM/GPRS/EGPRS1800, WCDMA900 and WCDMA2100 bands which are not part of this filing.

This is a BT Class 1 device; as its power tuning target plus tolerance is 8.5dBm (7.08mW), SAR testing was deemed unnecessary since (7.08mW/5mm)*√2.48GHz < 3.0 (KDB447498 D01 General RF Exposure Guidelines v05 Section 4.3.1 Standalone SAR test exclusion considerations)

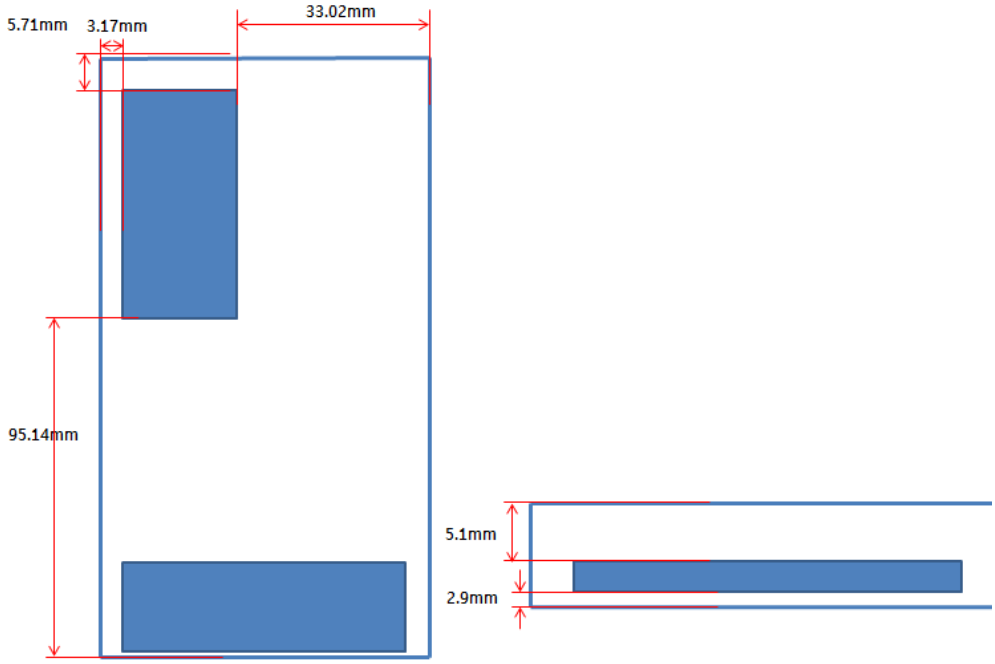
2.1 Description of the Antenna

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

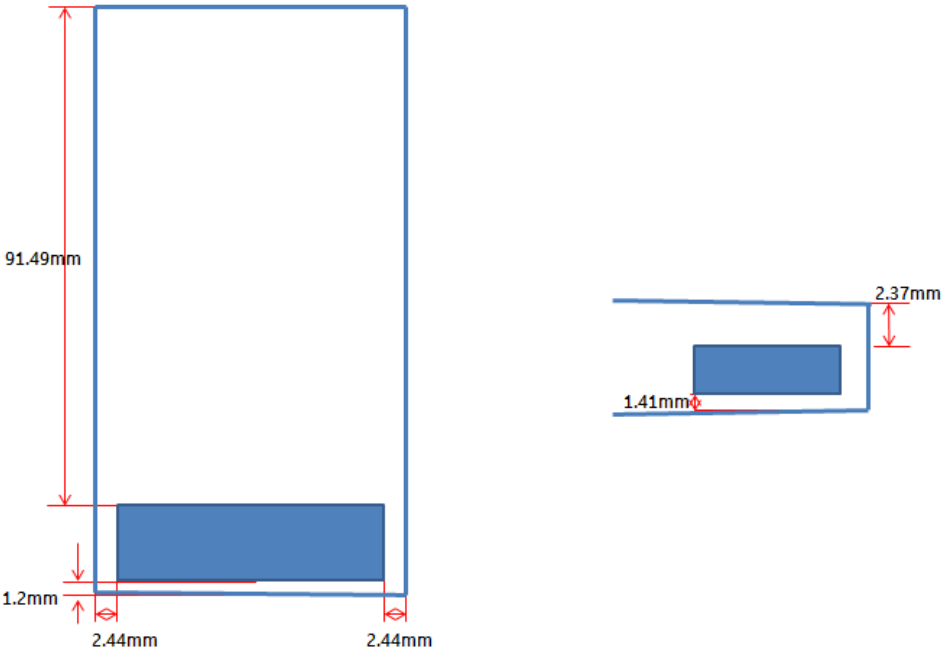
Phone Dimension and Distance Between Main antenna and BT Antenna



Distances between Outside surfaces of Device and BT 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; Dual Transfer Mode was not specifically tested as the average power in multi-slot GMSK GPRS mode is always greater than, or equal to, the average power in Dual Transfer Mode in Nokia devices.

A CMU200 call tester was used for all the GSM/GPRS tests, for which the MS signal was always set to maximum power. 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.

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

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 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	860	2012-10	2013-10
DAE 4	1324	2012-02	2013-02
E-field Probe EX3DV4	3839	2012-10	2013-10
E-field Probe EX3DV4	3838	2012-02	2013-02
Dipole Validation Kit, D835V2	4d005	2012-03	2014-03
Dipole Validation Kit, D1900V2	547	2011-10	2013-10
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	110735	-	-
Call Tester	CMU200	835352/008	-	-
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 tests i.e. for both system checks and device testing, was the twin-headed "SAM Phantom", manufactured by SPEAG. The phantom conforms to the requirements of IEEE 1528 - 2003.

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

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

4.3 Tissue Simulants

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

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
835	TCC Beijing / SAR-3	V4.7	D835V2 / 4d005	EX3DV4 / 3838	DAE4 / 1324	2012-04	-
1900	TCC Beijing / SAR-3	V4.7	D1900V2 / 547	EX3DV4 / 3574	DAE4 / 887	2012-02	-

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
			εr	1g	dSAR [%]	dεr [%]	dσ [%]	[°C]
	Deviation of tolerances				±10 %	±5 %	±5 %	
	Reference result	2.32	41.5	0.89				
	IEEE1528 / IEC62209 Standard targets		41.5	0.90				
835	2012-12-11	2.40	41.4	0.88	3.45	-0.24	-1.12	22.2
	Reference result	10.4	39.5	1.43				
	IEEE1528 / IEC62209 Standard targets		40.0	1.40				
1900	2012-12-12	9.92	39.3	1.44	-4.62	-0.51	0.70	21.7
	2012-12-18	9.71	38.4	1.44	-6.63	-2.78	0.70	22.4

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
			εr	1g	dSAR [%]	dεr [%]	dσ [%]	[°C]
	Deviation of tolerances				±10 %	±5 %	±5 %	
	Reference result	2.42	55.0	1.00				
	FCC Supplement C Standard targets		55.2	0.97				
835	2012-12-13	2.44	53.8	0.97	0.83	-2.18	-3.00	22.1
	2012-12-18	2.54	53.8	0.97	4.96	-2.18	-3.00	22.4
	Reference result	10.6	54.2	1.59				
	FCC Supplement C Standard targets		53.3	1.52				
1900	2012-12-13	10.2	52.3	1.53	-3.77	-3.51	-3.77	22.1

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			
	± 5% window	39.4 – 43.6	0.86 – 0.95			
836	2012-12-11	41.4	0.88	-0.24	-2.22	22.2
	Recommended value	40.0	1.40			
	± 5% window	38.0 – 42.0	1.33 – 1.47			
1880	2012-12-12	39.4	1.43	-1.50	2.14	21.7
	2012-12-18	38.4	1.42	-4.00	1.43	22.4

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			
	± 5% window	52.4 – 58.0	0.92 – 1.02			
836	2012-12-13	53.8	0.97	-2.54	0.00	22.1
	2012-12-18	53.8	0.97	-2.54	0.00	22.4
	Recommended value	53.3	1.52			
	± 5% window	50.6 – 56.0	1.44 – 1.60			
1880	2012-12-13	52.4	1.52	-1.69	0.00	22.1

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 below 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]	32.93	32.89	32.93	0.50	0.50	0.50	dB
	Time-averaged power [dBm]	23.90	23.86	23.90	1.12	1.12	1.12	Lin
	Left Cheek	-	0.504	-	-	0.565	-	-
	Left Tilt	-	0.337	-	-	0.378	-	-
	Right Cheek	0.479	0.559	**0.643**	0.537	0.627	**0.721**	1
	Right Tilt	-	0.336	-	-	0.377	-	-

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]	30.92	30.9	30.85	0.50	0.50	0.50	dB
	Time-averaged power [dBm]	21.89	21.87	21.82	1.12	1.12	1.12	Lin
	Left Cheek	**1.09**	0.839	0.732	**1.22**	0.941	0.821	-
	Left Tilt	-	0.43	-	-	0.482	-	-
	Right Cheek	1.02	0.856	0.765	1.14	0.960	0.858	-
	Right Tilt	-	0.348	-	-	0.390	-	-
	Repeated SAR: Left Cheek	**1.12**	-	-	**1.25**	-	-	2

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

Test configuration	Max. 1g SAR results		
	BT2450	GSM850	GSM1900
Head: Left, Cheek	0.32†	0.565	1.25
Head: Left, Tilt	0.32†	0.378	0.482
Head: Right, Cheek	0.32†	0.721	1.14
Head: Right, Tilt	0.32†	0.377	0.390

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

Test configuration	Max. 1g SAR results	
	GSM850+BT2450†	GSM1900+BT2450†
Head: Left, Cheek	0.885	**1.57**
Head: Left, Tilt	0.698	0.802
Head: Right, Cheek	**1.04**	1.46
Head: Right, Tilt	0.697	0.710

† SAR value estimated, according to KDB447498 from: [(max. power of channel, including tune-up tolerance, mW) / 5mm].[√2.800 / 7.5] W/kg

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	
1-slot GPRS	Tuning Target + Tolerance [dBm]		32.85			Scaling factor*			
	Conducted Slot Average Power [dBm]		32.93	32.89	32.93	0.50	0.50	0.50	dB
	Time-averaged power [dBm]		23.90	23.86	23.90	1.12	1.12	1.12	Lin
	Back facing phantom	Without headset	0.799	0.796	0.792	0.896	0.893	0.889	-
		Headset WH-109	-	-	-	-	-	-	-
	Display facing phantom,	Without headset	-	-	-	-	-	-	-
		Headset WH-109	-	-	-	-	-	-	-
2-slot GPRS	Tuning Target + Tolerance [dBm]		29.85			Scaling factor*			
	Conducted Slot Average Power [dBm]		29.87	29.90	29.88	0.50	0.50	0.50	dB
	Time-averaged power [dBm]		23.85	23.88	23.86	1.12	1.12	1.12	Lin
	Back facing phantom	Without headset	**0.817**	0.811	0.794	**0.917**	0.910	0.891	-
		Headset WH-109	-	0.408	-	-	0.458	-	-
	Display facing phantom,	Without headset	-	0.57	-	-	0.640	-	-
		Headset WH-109	-	0.395	-	-	0.443	-	-
	Repeated SAR: Back facing phantom, without headset		**0.874**	-	-	**0.979**	-	-	3
3-slot GPRS	Tuning Target + Tolerance [dBm]		28.05			Scaling factor*			
	Conducted Slot Average Power [dBm]		28.07	28.05	28.09	0.50	0.50	0.50	dB
	Time-averaged power [dBm]		23.81	23.79	23.83	1.12	1.12	1.12	Lin
	Back facing phantom	Without headset	0.803	0.790	0.776	0.901	0.886	0.871	-
		Headset WH-109	-	-	-	-	-	-	-
	Display facing phantom,	Without headset	-	-	-	-	-	-	-
		Headset WH-109	-	-	-	-	-	-	-
4-slot GPRS	Tuning Target + Tolerance [dBm]		26.85			Scaling factor*			
	Conducted Slot Average Power [dBm]		26.92	26.90	26.98	0.50	0.50	0.50	dB
	Time-averaged power [dBm]		23.91	23.89	23.97	1.12	1.12	1.12	Lin
	Back facing phantom	Without headset	0.809	0.793	0.801	0.908	0.890	0.899	-
		Headset WH-109	-	-	-	-	-	-	-
	Display facing phantom,	Without headset	-	-	-	-	-	-	-
		Headset WH-109	-	-	-	-	-	-	-

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	
1-slot GPRS	Tuning Target + Tolerance [dBm]		30.85			Scaling factor*			
	Conducted Slot Average Power [dBm]		30.92	30.9	30.85	0.50	0.50	0.50	dB
	Time-averaged power [dBm]		21.89	21.87	21.82	1.12	1.12	1.12	Lin
	Back facing phantom	Without headset	-	0.467	-	-	0.524	-	-
		Headset WH-109	-	-	-	-	-	-	-
	Display facing phantom,	Without headset	-	-	-	-	-	-	-
		Headset WH-109	-	-	-	-	-	-	-
2-slot GPRS	Tuning Target + Tolerance [dBm]		27.85			Scaling factor*			
	Conducted Slot Average Power [dBm]		27.88	27.9	27.94	0.50	0.50	0.50	dB
	Time-averaged power [dBm]		21.86	21.88	21.92	1.12	1.12	1.12	Lin
	Back facing phantom	Without headset	-	0.464	-	-	0.521	-	-
		Headset WH-109	-	-	-	-	-	-	-
	Display facing phantom,	Without headset	-	-	-	-	-	-	-
		Headset WH-109	-	-	-	-	-	-	-
3-slot GPRS	Tuning Target + Tolerance [dBm]		26.05			Scaling factor*			
	Conducted Slot Average Power [dBm]		26.06	26.07	26.05	0.50	0.50	0.50	dB
	Time-averaged power [dBm]		21.80	21.81	21.79	1.12	1.12	1.12	Lin
	Back facing phantom	Without headset	-	0.484	-	-	0.543	-	-
		Headset WH-109	-	-	-	-	-	-	-
	Display facing phantom,	Without headset	-	-	-	-	-	-	-
		Headset WH-109	-	-	-	-	-	-	-
4-slot GPRS	Tuning Target + Tolerance [dBm]		24.85			Scaling factor*			
	Conducted Slot Average Power [dBm]		24.88	24.92	24.9	0.50	0.50	0.50	dB
	Time-averaged power [dBm]		21.87	21.91	21.89	1.12	1.12	1.12	Lin
	Back facing phantom	Without headset	-	0.505	-	-	0.567	-	-
		Headset WH-109	-	0.501	-	-	0.562	-	-
	Display facing phantom,	Without headset	**0.621**	0.576	0.538	**0.697**	0.646	0.604	4
		Headset WH-109	-	0.536	-	-	0.601	-	-

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

Test configuration	Max. 1g SAR results		
	BT2450	GSM850	GSM1900
Body: Back facing phantom, Without Headset	0.11†	0.979	0.567
Body: Back facing phantom, Headset WH-109	0.11†	0.458	0.562
Body: Display facing phantom, Without Headset	0.11†	0.640	0.697
Body: Display facing phantom, Headset WH-109	0.11†	0.443	0.601

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

Test configuration	Max. 1g SAR results	
	GSM850+BT2450†	GSM1900+BT2450†
Body: Back facing phantom, Without Headset	**1.09**	0.677
Body: Back facing phantom, Headset WH-109	0.568	0.672
Body: Display facing phantom, Without Headset	0.750	**0.807**
Body: Display facing phantom, Headset WH-109	0.553	0.711

† SAR value estimated, according to KDB447498 from: [(max. power of channel, including tune-up tolerance, mW) / 15mm].[√2.800 / 7.5] W/kg

* 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.

Plots of the Measurement scans are given in Appendix B.

APPENDIX A: SYSTEM CHECKING SCANS

Date/Time: 2012-12-11 10:00:44 AM

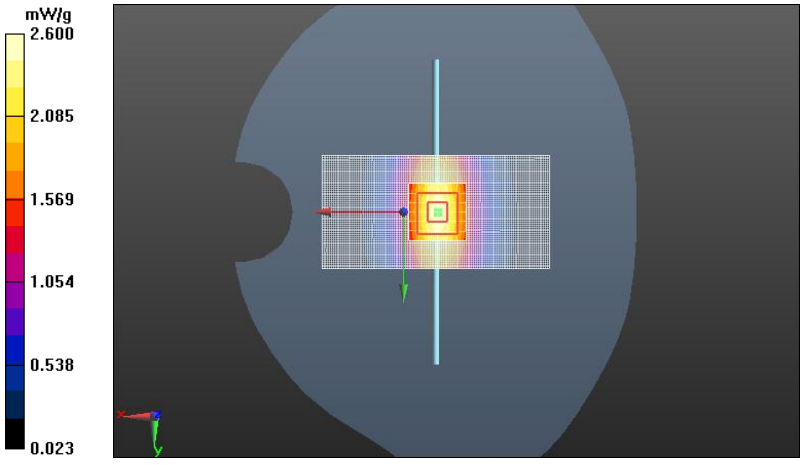
Test Laboratory: TCC Nokia
Type: D835V2; Serial: 4d005

Communication System: CW835
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: Head 835; Medium Notes: Medium Temperature: t= 22.1 C
Medium parameters used: f = 835 MHz; σ = 0.875 mho/m; ε_r = 41.406; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY Configuration:
- Probe: EX3DV4 - SN3839
- ConvF(8.74, 8.74, 8.74); Calibrated: 2012-10-25;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn860; Calibrated: 2012-10-17
- Phantom: SAM1; Type: SAM; Serial: TP - 01097
- 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) = 2.60 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.824 V/m
Peak SAR (extrapolated) = 3.592 mW/g
SAR(1 g) = 2.4 mW/g
SAR(10 g) = 1.57 mW/g
Power Drift = -0.06 dB
Maximum value of SAR (measured) = 2.59 mW/g



Date/Time: 2012-12-12 9:41:53 AM

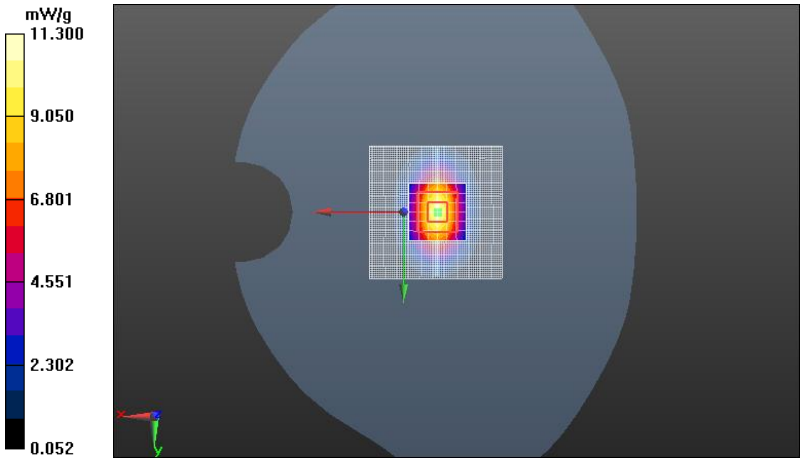
Test Laboratory: TCC Nokia
Type: D1900V2; Serial: 547

Communication System: CW1900
Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: Head 1900; Medium Notes: Medium Temperature: t=21.7
Medium parameters used: f = 1900 MHz; σ = 1.44 mho/m; ε_r = 39.303; 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) = 11.3 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 88.238 V/m
Peak SAR (extrapolated) = 18.775 mW/g
SAR(1 g) = 9.92 mW/g
SAR(10 g) = 5.11 mW/g
Power Drift = -0.06 dB
Maximum value of SAR (measured) = 11.1 mW/g



Date/Time: 2012-12-18 1:46:42 PM

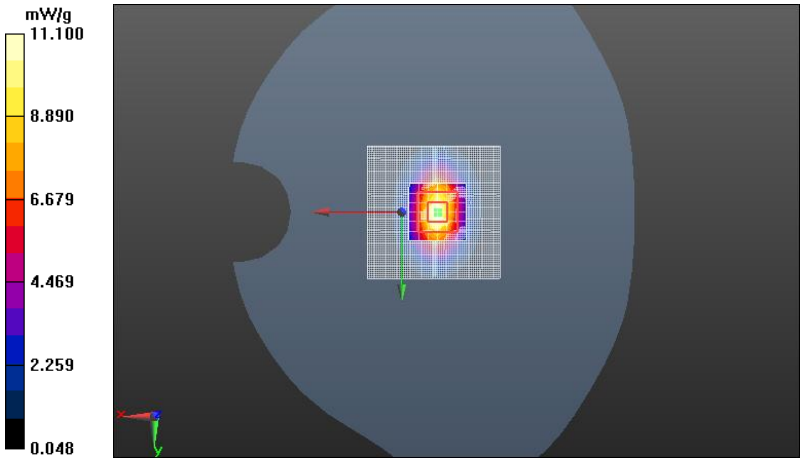
Test Laboratory: TCC Nokia
Type: D1900V2; Serial: 547

Communication System: CW1900
Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: Head 1900 SAM7; Medium Notes: Medium Temperature: t=22.4C SAM7
Medium parameters used: f = 1900 MHz; σ = 1.439 mho/m; ε_r = 38.363; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY Configuration:
- Probe: EX3DV4 - SN3838
- ConvF(7.57, 7.57, 7.57); Calibrated: 2012-02-20;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2012-02-15
- Phantom: SAM7; Type: SAM; Serial: TP - 1412
- 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) = 11.1 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 87.586 V/m
Peak SAR (extrapolated) = 18.072 mW/g
SAR(1 g) = 9.71 mW/g
SAR(10 g) = 5.02 mW/g
Power Drift = -0.16 dB
Maximum value of SAR (measured) = 10.9 mW/g



Date/Time: 2012-12-13 10:04:40 AM

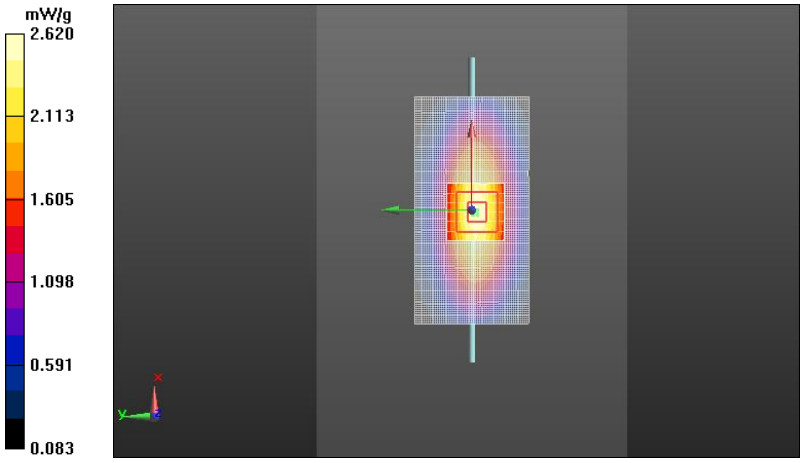
Test Laboratory: TCC Nokia
Type: D835V2; Serial: 4d005

Communication System: CW835
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: Body 835; Medium Notes: Medium Temperature: t= 22.1 C
Medium parameters used: f = 835 MHz; σ = 0.965 mho/m; ε_r = 53.847; 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 (61x121x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 2.62 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 51.925 V/m
Peak SAR (extrapolated) = 3.599 mW/g
SAR(1 g) = 2.44 mW/g
SAR(10 g) = 1.61 mW/g
Power Drift = -0.01 dB
Maximum value of SAR (measured) = 2.63 mW/g



Date/Time: 2012-12-18 3:13:45 PM

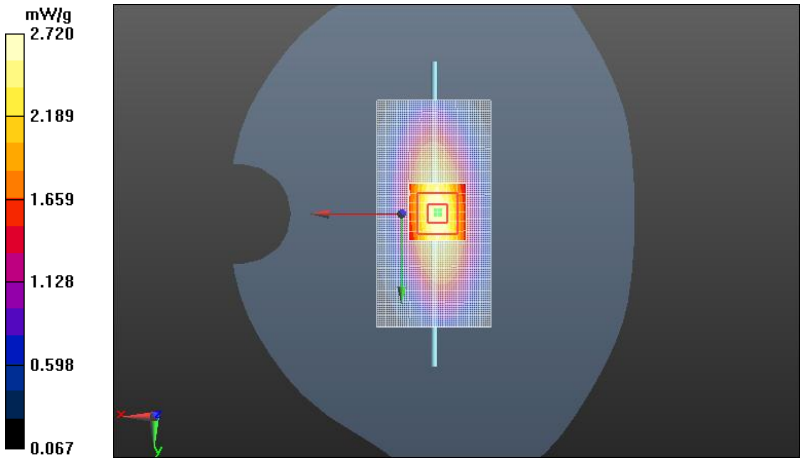
Test Laboratory: TCC Nokia
Type: D835V2; Serial: 4d005

Communication System: CW835
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: Body 835 SAM9; Medium Notes: Medium Temperature: t= 22.4 C
Medium parameters used: f = 835 MHz; σ = 0.967 mho/m; ε_r = 53.766; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY Configuration:
- Probe: EX3DV4 - SN3838
- ConvF(8.86, 8.86, 8.86); Calibrated: 2012-02-20;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2012-02-15
- Phantom: SAM9; Type: SAM; Serial: TP - 1693
- 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) = 2.72 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.979 V/m
Peak SAR (extrapolated) = 3.783 mW/g
SAR(1 g) = 2.54 mW/g
SAR(10 g) = 1.68 mW/g
Power Drift = -0.03 dB
Maximum value of SAR (measured) = 2.74 mW/g



Date/Time: 2012-12-13 3:24:02 PM

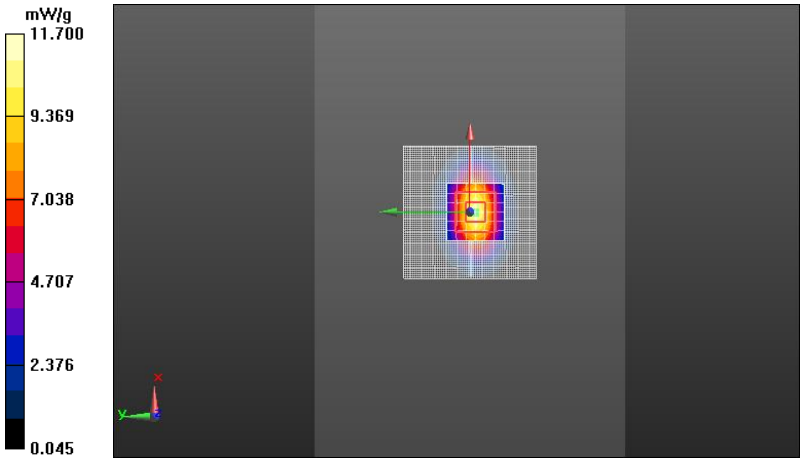
Test Laboratory: TCC Nokia
Type: D1900V2; Serial: 547

Communication System: CW1900
Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: Body 1900; Medium Notes: Medium Temperature: t=22.1
Medium parameters used: f = 1900 MHz; σ = 1.532 mho/m; ε_r = 52.307; 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) = 11.7 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 84.125 V/m
Peak SAR (extrapolated) = 18.654 mW/g
SAR(1 g) = 10.2 mW/g
SAR(10 g) = 5.34 mW/g
Power Drift = 0.01 dB
Maximum value of SAR (measured) = 11.6 mW/g



APPENDIX B: MAXIMUM MEASUREMENT PLOTS

Plot 1: GSM850 Right Cheek, High Channel
Measured SAR value: **0.643W/kg** in 1g

Plot 2: GSM1900 Left Cheek, Low Channel
Measured SAR value: **1.12W/kg** in 1g

Plot 3: 2-slot GPRS850 Back facing Phantom, No Accessory, Low Channel
Measured SAR value: **0.874W/kg** in 1g

Plot 4: 4-slot GPRS1900 Display facing Phantom, No Accessory, Low Channel
Measured SAR value: **0.621W/kg** in 1g

Plot 1: GSM850 Right Cheek, High Channel Measured SAR value: **0.643W/kg** in 1g
Date/Time: 2012-12-11 12:25:49 PM

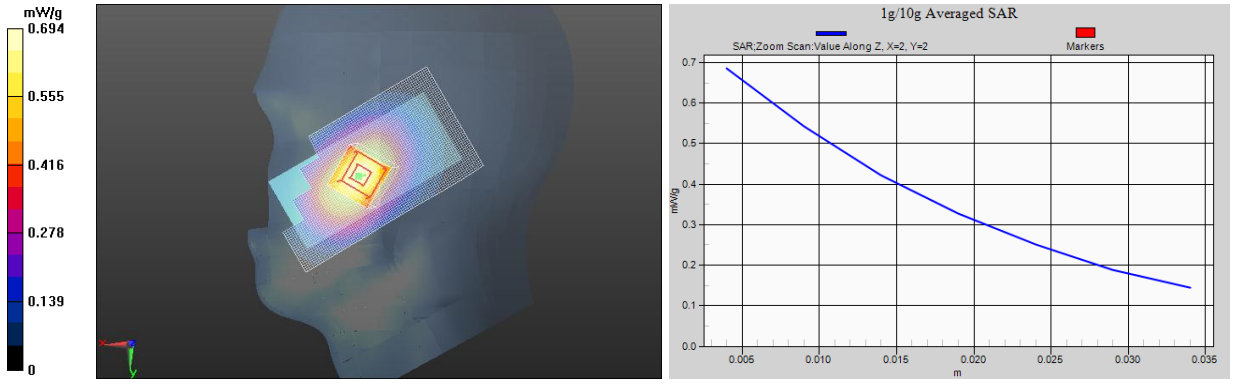
Test Laboratory: TCC Nokia
Type: RM-840; Serial: 004402/47/186434/2

Communication System: GSM850
Frequency: 848.8 MHz; Duty Cycle: 1:8.3
Medium: Head 835; Medium Notes: Medium Temperature: t= 22.1 C
Medium parameters used: f = 849 MHz; σ = 0.885 mho/m; ε_r = 41.166; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY Configuration:
- Probe: EX3DV4 - SN3839
- ConvF(8.74, 8.74, 8.74); Calibrated: 2012-10-25;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn860; Calibrated: 2012-10-17
- Phantom: SAM1; Type: SAM; Serial: TP - 01097
- Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.5 (6469)

Cheek - High/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.694 mW/g

Cheek - High/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 8.953 V/m
Peak SAR (extrapolated) = 0.801 mW/g
SAR(1 g) = 0.643 mW/g
SAR(10 g) = 0.471 mW/g
Power Drift = -0.12 dB
Maximum value of SAR (measured) = 0.686 mW/g



Plot 2: GSM1900 Left Cheek, Low Channel Measured SAR value: **1.12W/kg** in 1g
Date/Time: 2012-12-18 2:48:26 PM

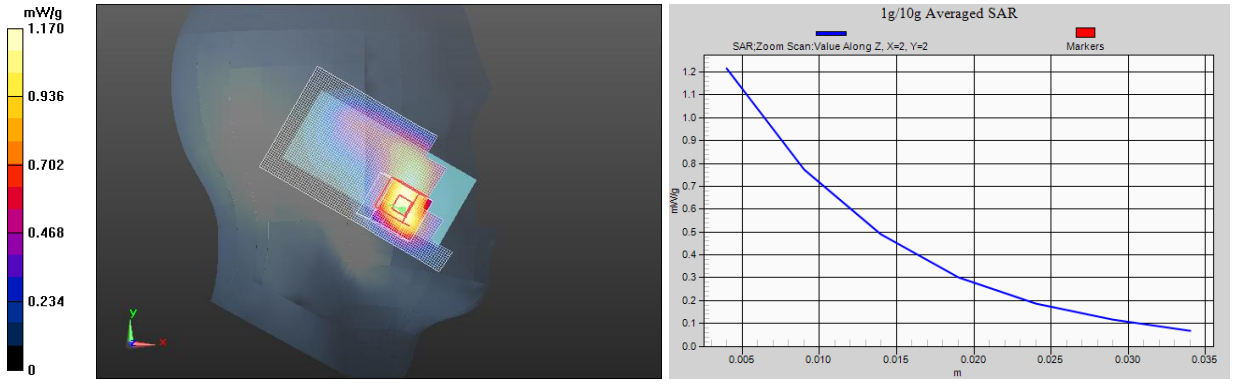
Test Laboratory: TCC Nokia
Type: RM-840; Serial: 004402/47/186434/2

Communication System: GSM1900
Frequency: 1850.2 MHz; Duty Cycle: 1:8.3
Medium: Head 1900 SAM7; Medium Notes: Medium Temperature: t=22.4C SAM7
Medium parameters used (interpolated): f = 1850.2 MHz; σ = 1.395 mho/m; ε_r = 38.546; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY Configuration:
- Probe: EX3DV4 - SN3838
- ConvF(7.57, 7.57, 7.57); Calibrated: 2012-02-20;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2012-02-15
- Phantom: SAM7; Type: SAM; Serial: TP - 1412
- Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.5 (6469)

Cheek - Low/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.17 mW/g

Cheek - Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 9.537 V/m
Peak SAR (extrapolated) = 1.778 mW/g
SAR(1 g) = 1.12 mW/g
SAR(10 g) = 0.673 mW/g
Power Drift = -0.32 dB
Maximum value of SAR (measured) = 1.22 mW/g



Plot 3: 2-slot GPRS850 Back facing Phantom, No Accessory, Low Channel Measured SAR value: **0.874W/kg** in 1g

Date/Time: 2012-12-18 4:34:03 PM

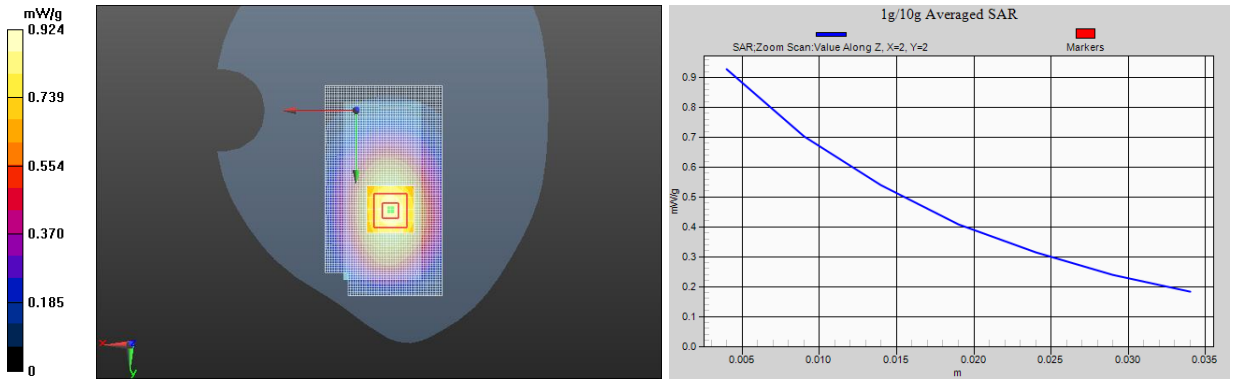
Test Laboratory: TCC Nokia
Type: RM-840; Serial: 004402/47/186434/2

Communication System: 2-slot GPRS850
Frequency: 824.2 MHz; Duty Cycle: 1:4.2
Medium: Body 835 SAM9; Medium Notes: Medium Temperature: t= 22.4 C
Medium parameters used (interpolated): f = 824.2 MHz; σ = 0.959 mho/m; ε_r = 53.858; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY Configuration:
- Probe: EX3DV4 - SN3838
- ConvF(8.86, 8.86, 8.86); Calibrated: 2012-02-20;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2012-02-15
- Phantom: SAM9; Type: SAM; Serial: TP - 1693
- Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.5 (6469)

Body - Low - No Accessory - Back Facing Phantom/Area Scan (91x51x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.924 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 = 11.323 V/m
Peak SAR (extrapolated) = 1.141 mW/g
SAR(1 g) = 0.874 mW/g
SAR(10 g) = 0.641 mW/g
Power Drift = -0.04 dB
Maximum value of SAR (measured) = 0.928 mW/g



Plot 4: 4-slot GPRS1900 Display facing Phantom, No Accessory, Low Channel Measured SAR value: **0.621W/kg** in 1g

Date/Time: 2012-12-14 11:35:34 AM

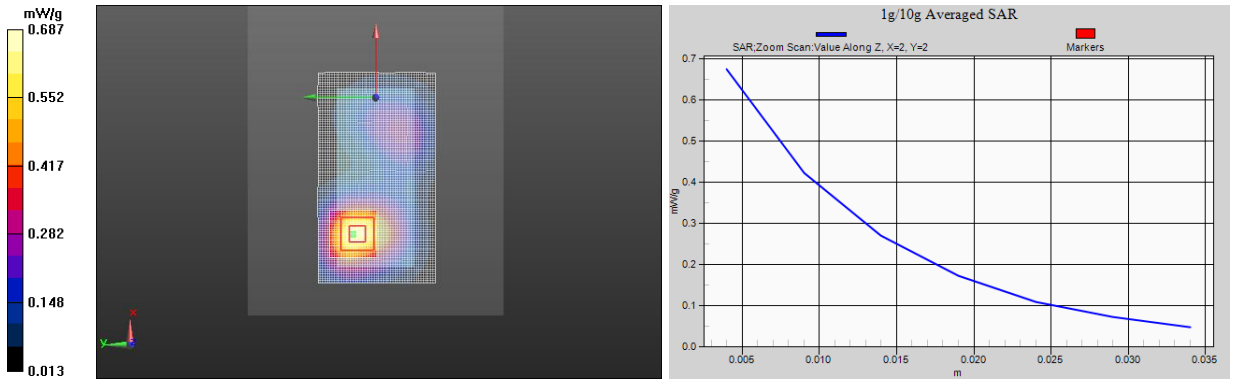
Test Laboratory: TCC Nokia
Type: RM-840; Serial: 004402/47/186434/2

Communication System: 4-slot GPRS1900
Frequency: 1850.2 MHz; Duty Cycle: 1:2.08
Medium: Body 1900; Medium Notes: Medium Temperature: t=22.1
Medium parameters used (interpolated): f = 1850.2 MHz; σ = 1.496 mho/m; ε_r = 52.582; 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)

Body - Low - No Accessory - Display Facing Phantom/Area Scan (91x51x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.687 mW/g

Body - Low - No Accessory - Display Facing Phantom/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 10.253 V/m
Peak SAR (extrapolated) = 0.995 mW/g
SAR(1 g) = 0.621 mW/g
SAR(10 g) = 0.376 mW/g
Power Drift = -0.05 dB
Maximum value of SAR (measured) = 0.674 mW/g



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/GPRS/ EGPRS850	2012-12-11	41.5	0.86	41.4	0.87	41.2	0.88
f (MHz)	**Date**	**Dielectric Parameters**					
		1850.0MHz		1880.0MHz		1910.0MHz	
		εr	σ [S/m]	εr	σ [S/m]	εr	σ [S/m]
GSM/GPRS/ EGPRS1900	2012-12-12	39.6	1.41	39.4	1.43	39.2	1.45
	2012-12-18	38.5	1.39	38.4	1.42	38.3	1.45

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/GPRS/ EGPRS850	2012-12-13	54.0	0.96	53.8	0.97	53.7	0.98
	2012-12-18	53.9	0.96	53.8	0.97	53.7	0.98
f (MHz)	**Date**	**Dielectric Parameters**					
		1850.0MHz		1880.0MHz		1910.0MHz	
		εr	σ [S/m]	εr	σ [S/m]	εr	σ [S/m]
GSM/GPRS/ EGPRS1900	2012-12-13	52.6	1.49	52.4	1.51	52.3	1.54

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
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.

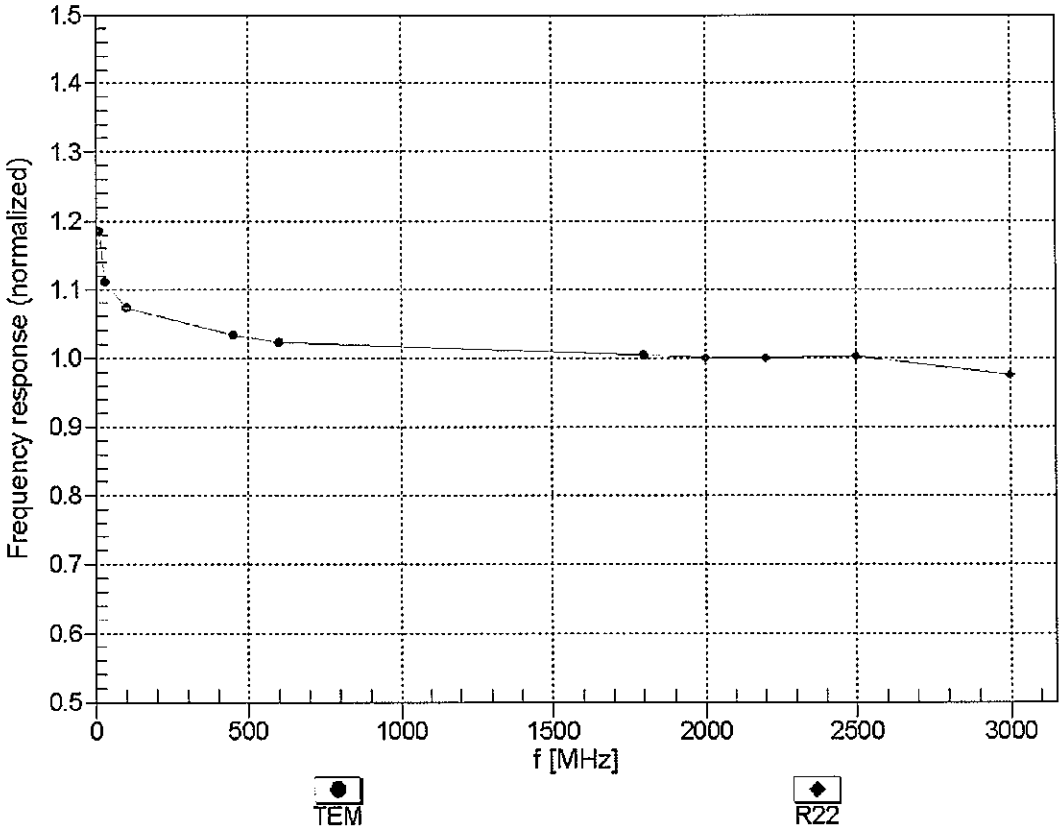
DASY/EASY - Parameters of Probe: EX3DV4 - SN:3839

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.

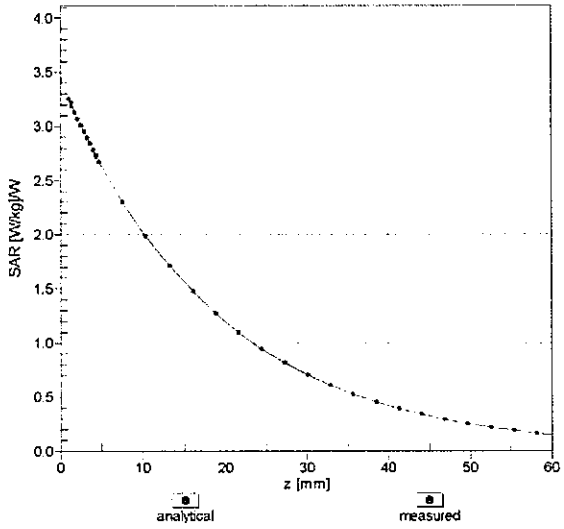
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



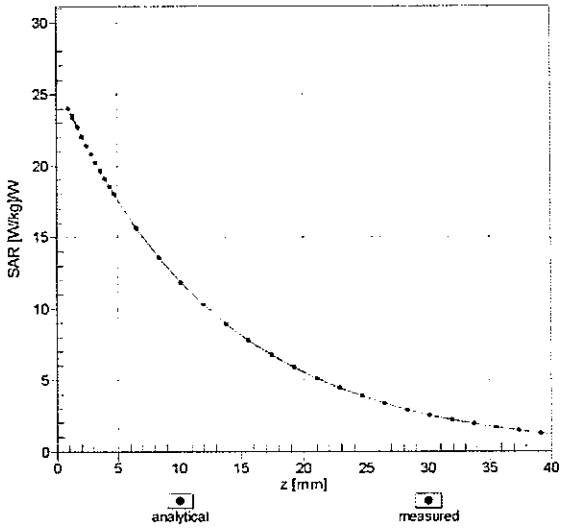
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

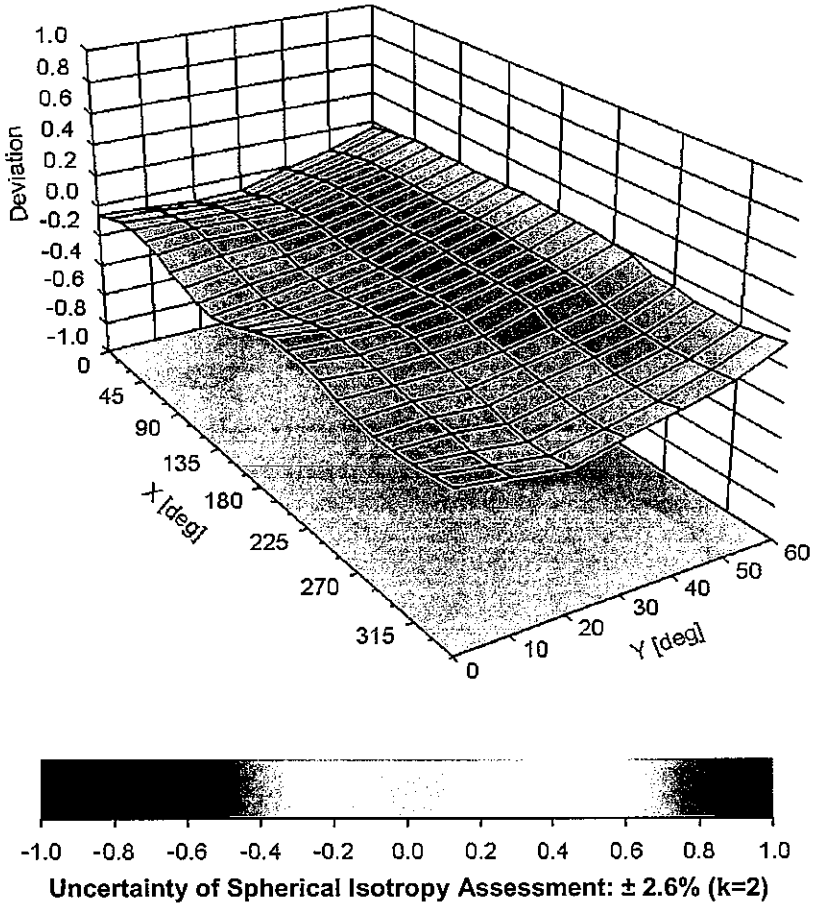


f = 1750 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

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

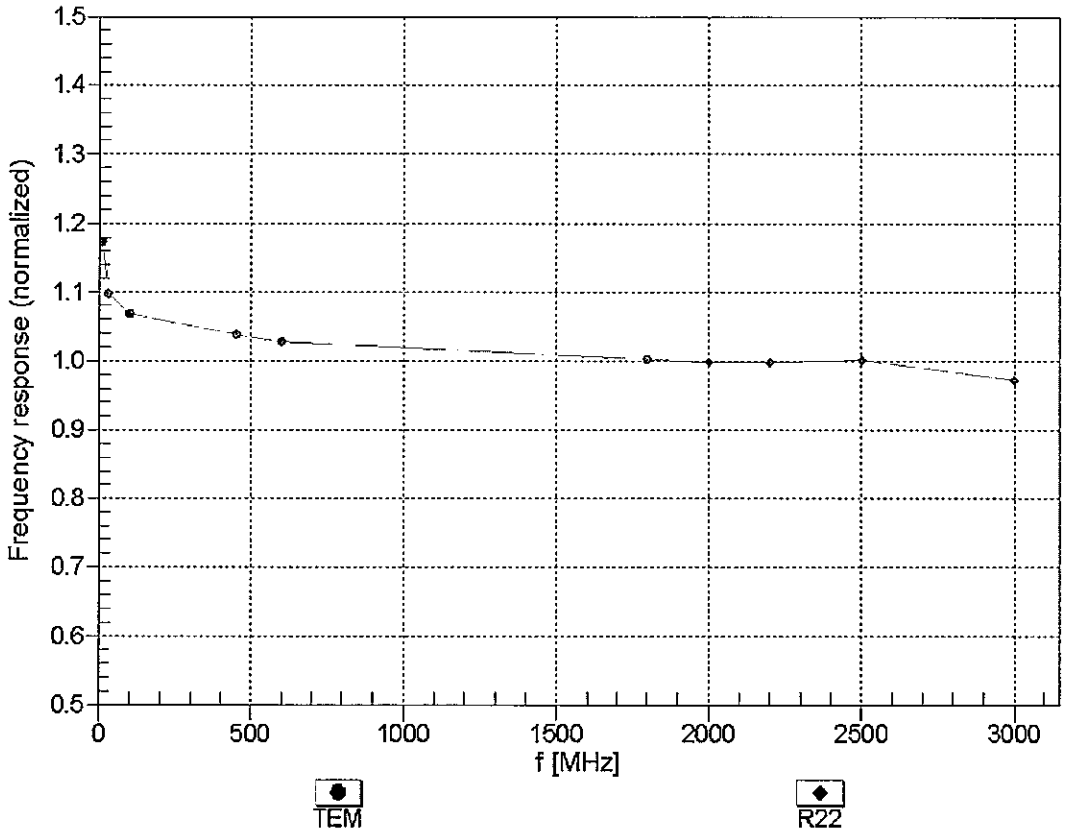
Calibration Parameter Determined in Body Tissue Simulating Media

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

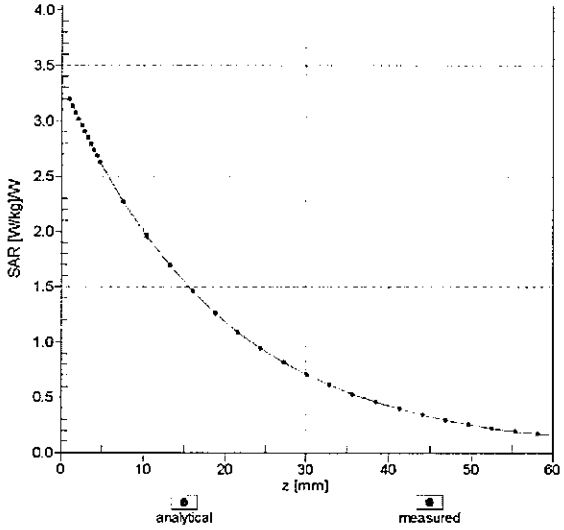
(TEM-Cell:ifi110 EXX, Waveguide: R22)



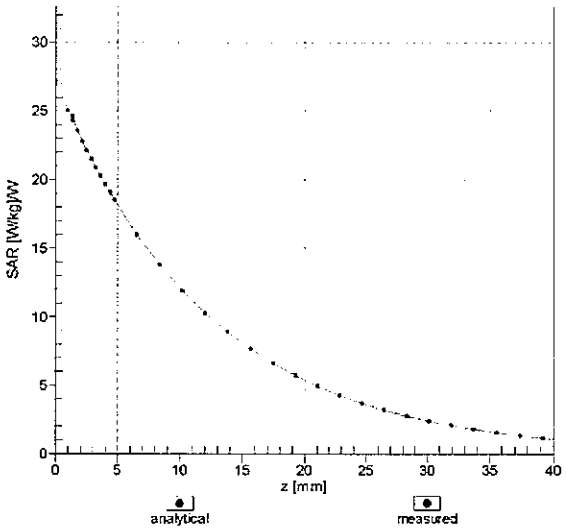
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

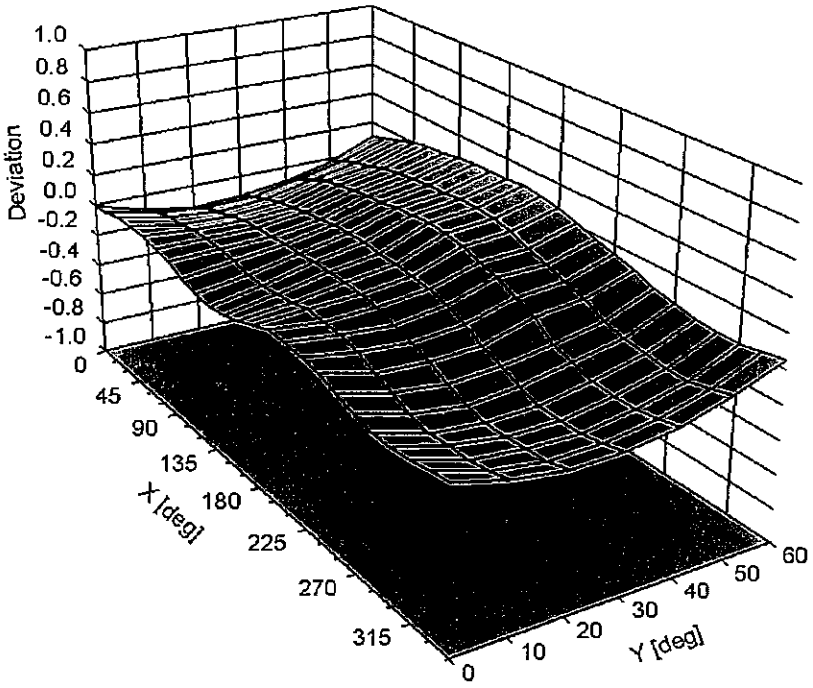


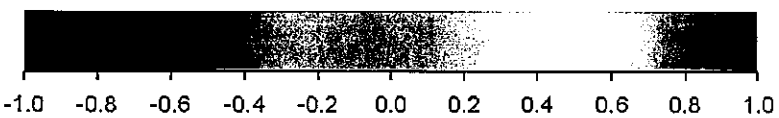
f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





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

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

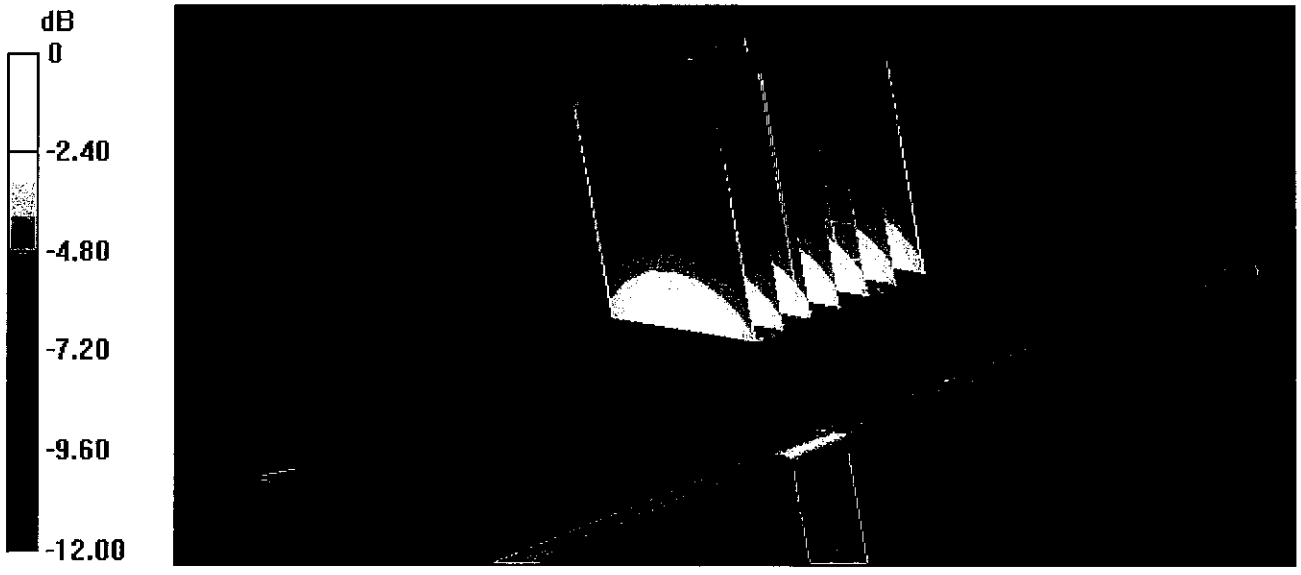
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.89 mho/m; ε_r = 41.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

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)

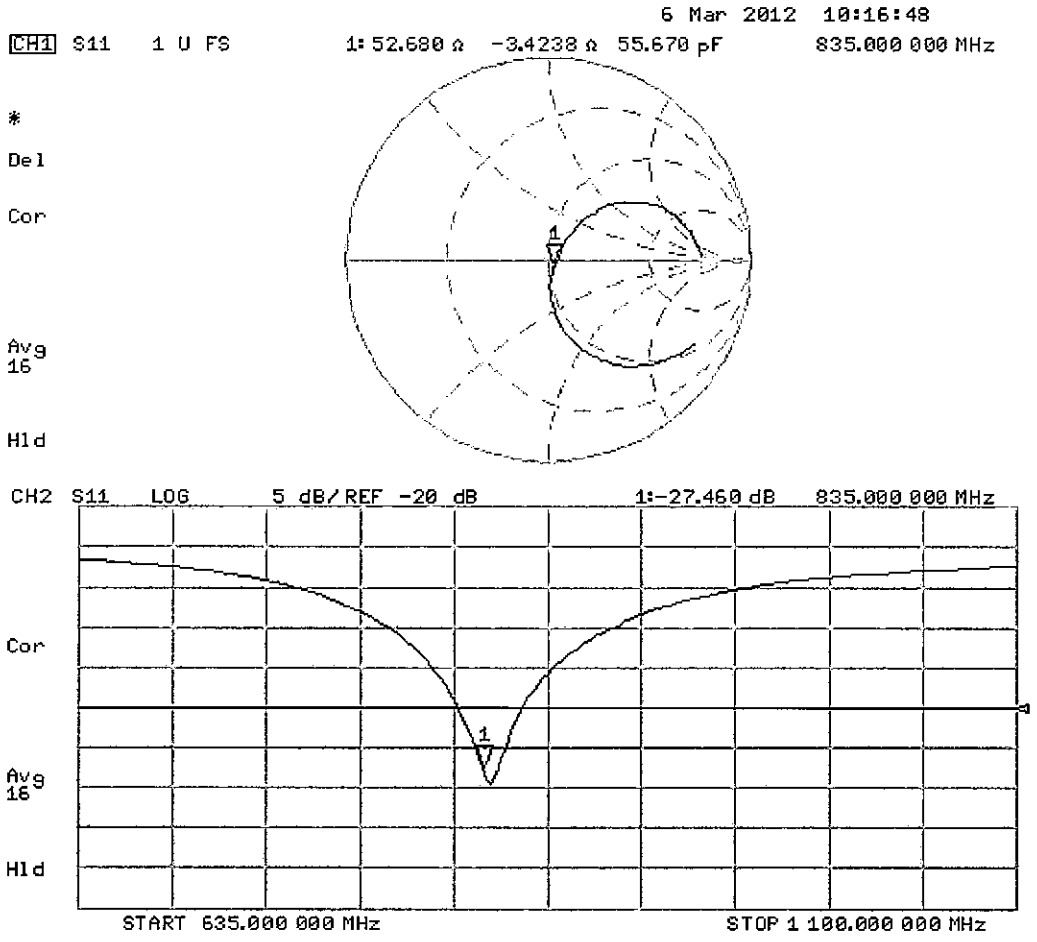
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

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

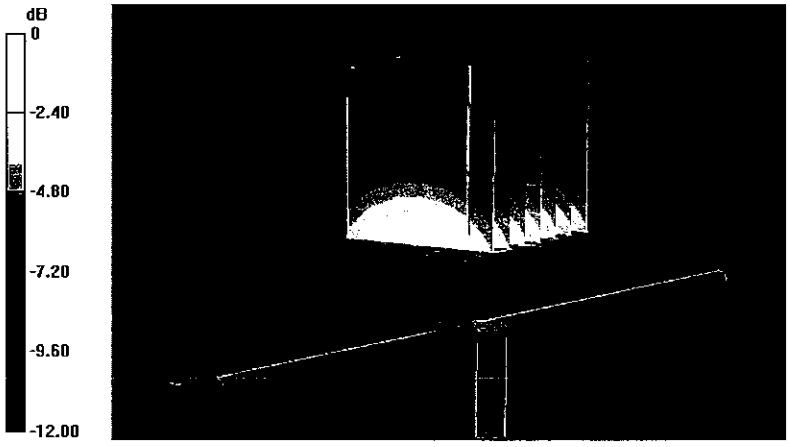
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 1 mho/m; ε_r = 55; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

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)

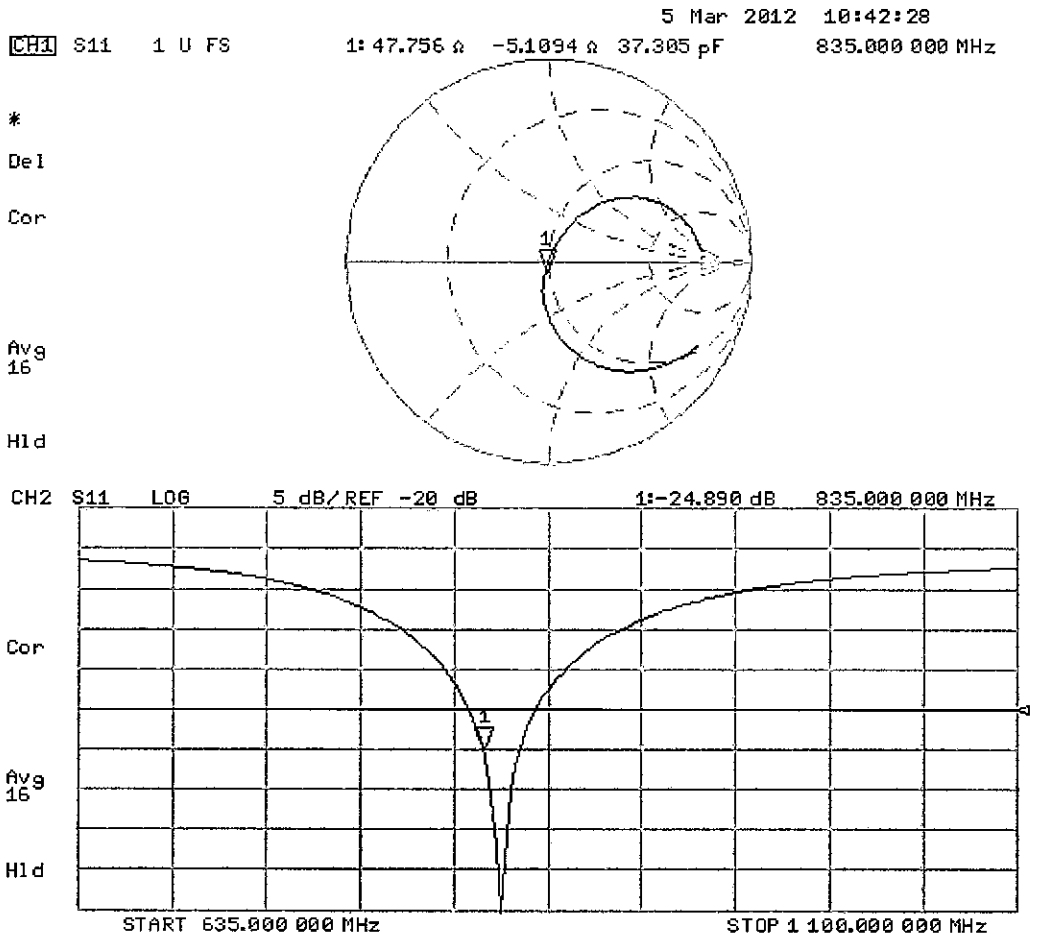
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

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

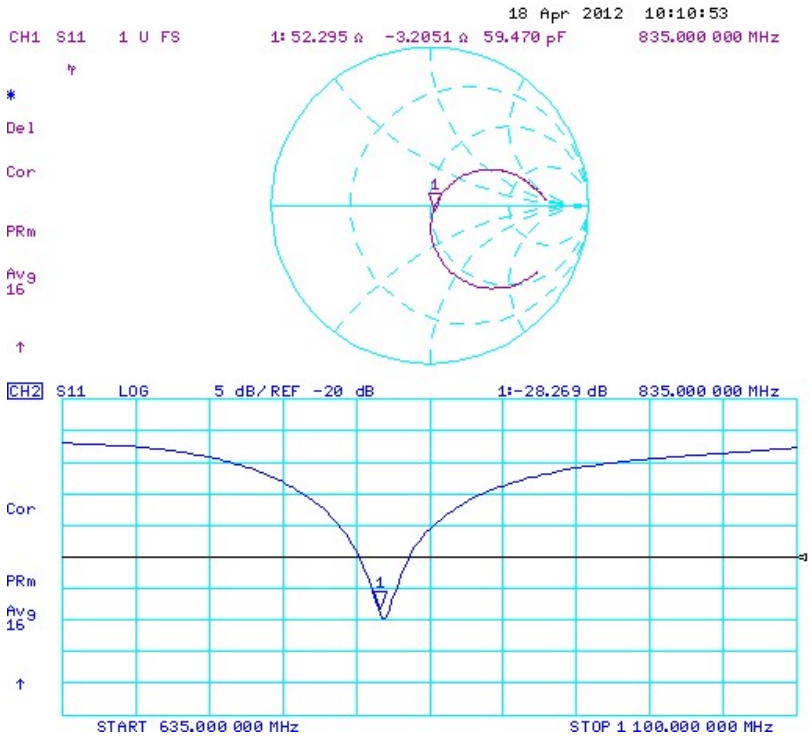
Antenna Parameters with Head TSL

	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

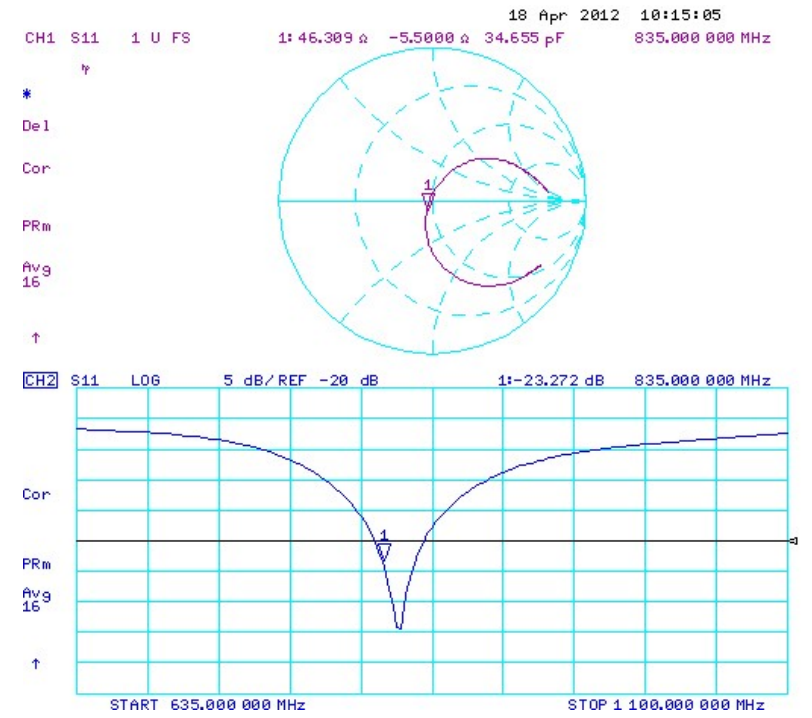
Antenna Parameters with Body TSL

	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
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

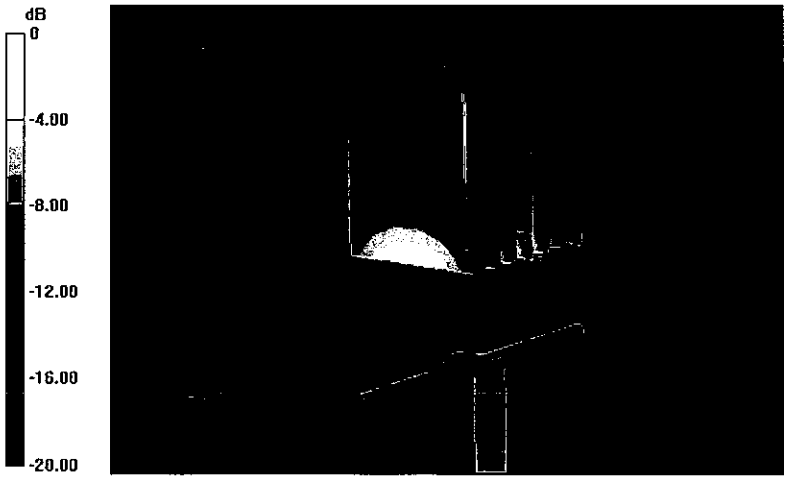
Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.43 mho/m; ε_r = 39.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

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)

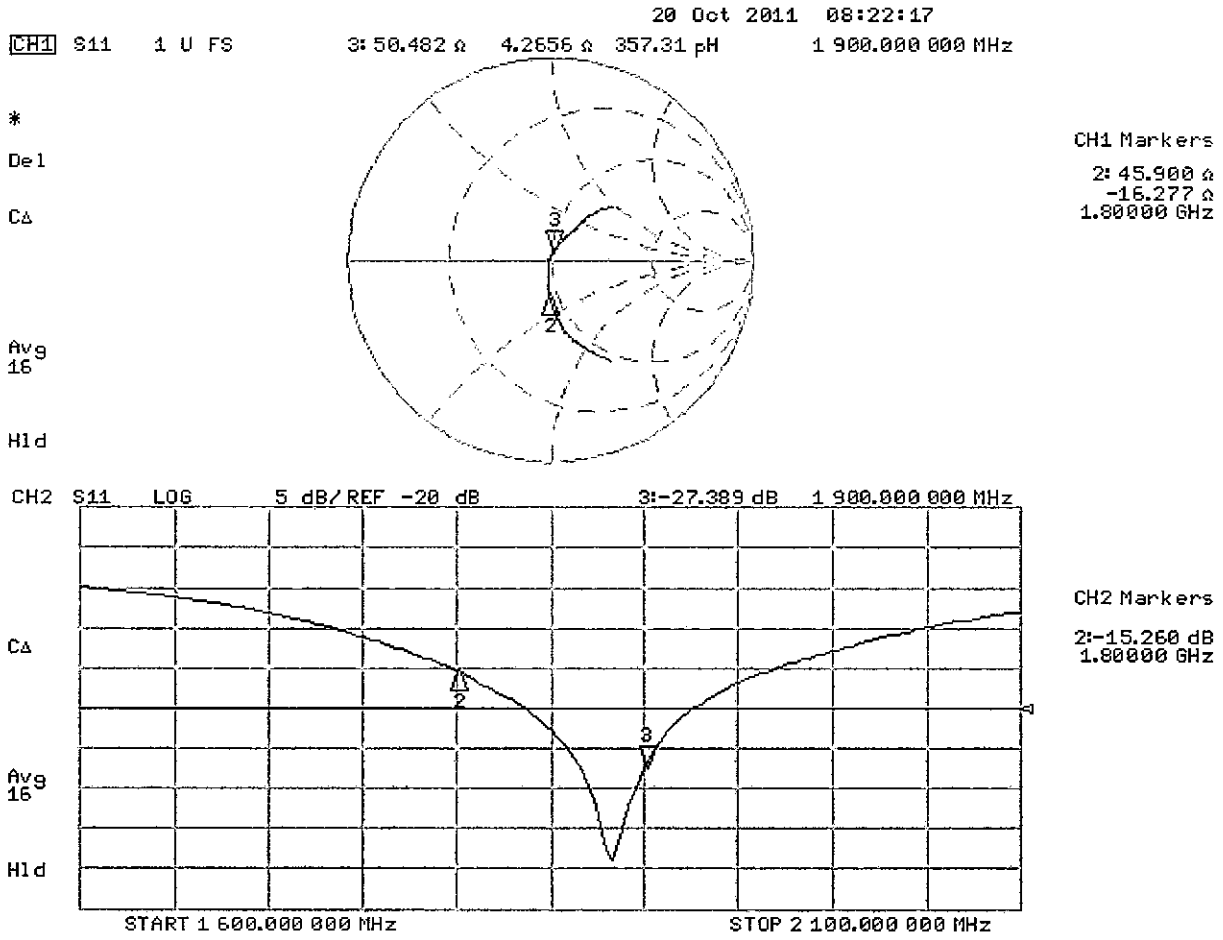
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

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

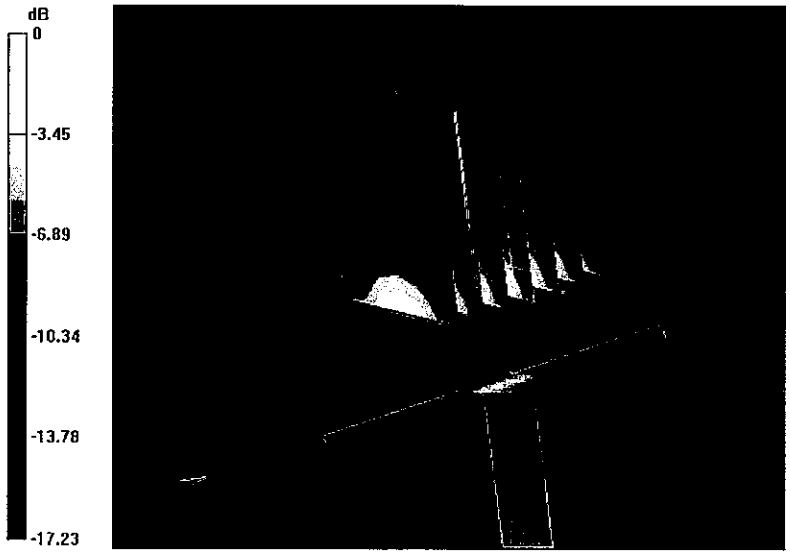
Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.59 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

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)

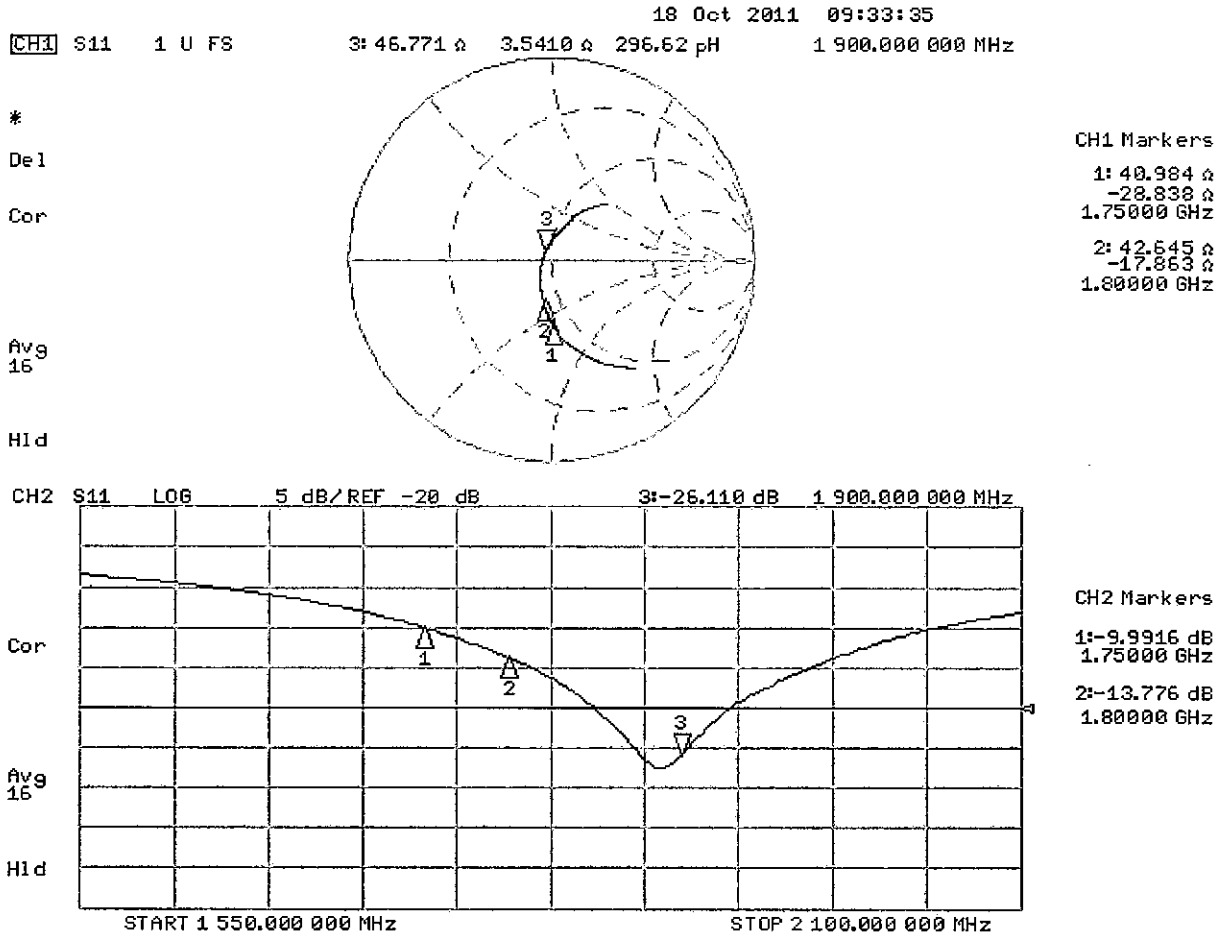
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

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

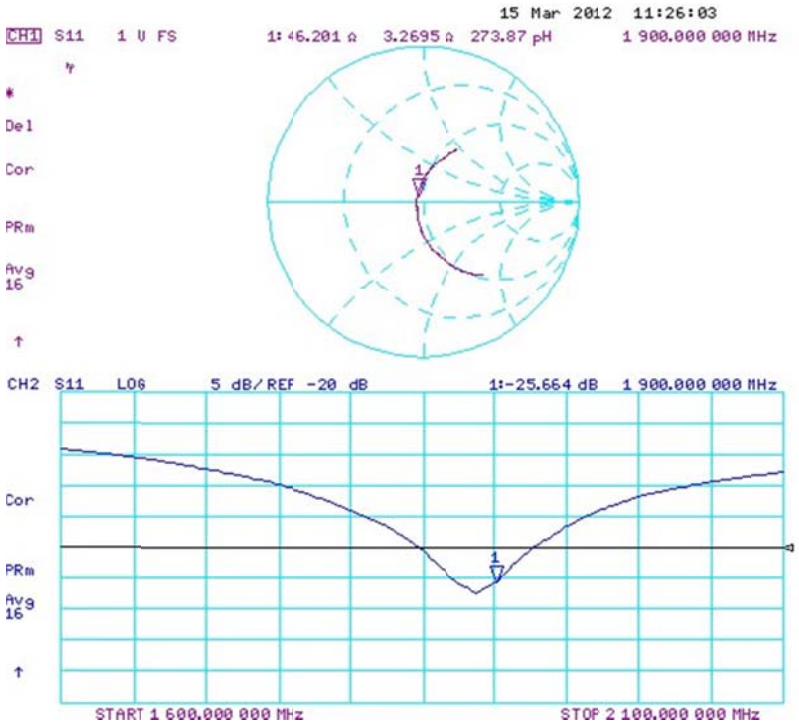
Antenna Parameters with Head TSL

	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

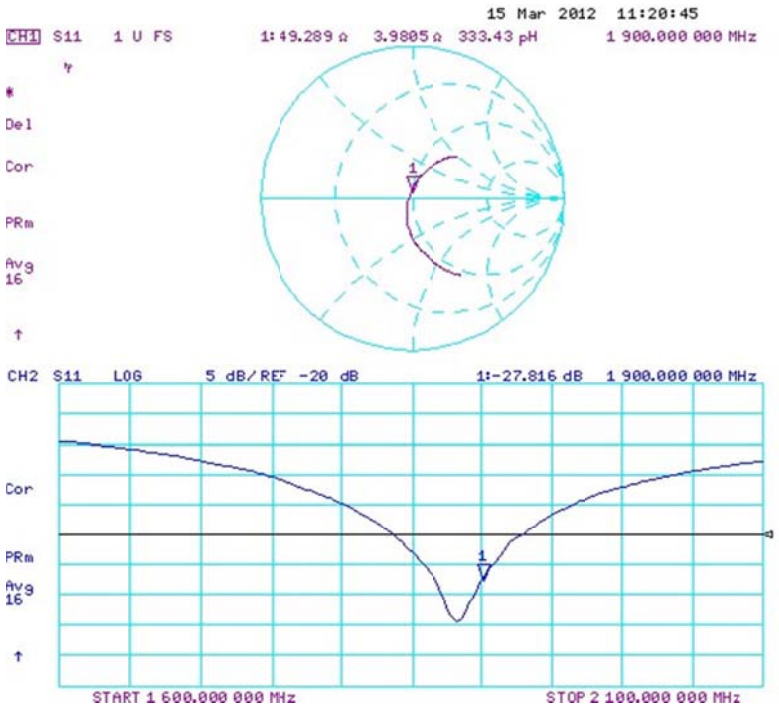
Antenna Parameters with Body TSL

	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



APPENDIX F: CONDUCTED POWER MEASUREMENTS FOR SUPPORTED GSM/GPRS/EGPRS 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-840; Serial number: 004402/47/186434/2 used for GSM/GPRS/EGPRS850 SAR Head and Body-worn measurements.

GSM 850			
Slot configuration	Low channel	Mid channel	High channel
GSM 1-slot	32.93	32.89	32.93
GPRS 2-slot	29.87	29.90	29.88
GPRS 3-slot	28.07	28.05	28.09
GPRS 4-slot	26.92	26.90	26.98
EGRPS 1-slot	-	-	-
EGPRS 2-slot	-	-	-
EGPRS 3-slot	-	-	-
EGPRS 4-slot	-	-	-

Type: RM-840; Serial number: 004402/47/186434/2 used for GSM/GPRS/EGPRS1900 SAR Head and Body-worn measurements.

GSM 1900			
Slot configuration	Low channel	Mid channel	High channel
GSM 1-slot	30.92	30.90	30.85
GPRS 2-slot	27.88	27.90	27.94
GPRS 3-slot	26.06	26.07	26.05
GPRS 4-slot	24.88	24.92	24.90
EGRPS 1-slot	-	-	-
EGPRS 2-slot	-	-	-
EGPRS 3-slot	-	-	-
EGPRS 4-slot	-	-	-