SAR Compliance Test Report

Test report no.:	FCC_RM-952_03	**Date of report:**	2013-06-26
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Measurements made by:	Yuan Rui, Liu Xianchao		

Tested device:	RM-952		
FCC ID:	QTLRM-952	**IC:**	-
Supplement reports:	SAR_Photo_RM-952_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	2013-06-16 to 2013-06-26
SN, HW and SW numbers of tested device	SN: 004402/47/428200/5, 004402/47/428201/3, HW: 0103, SW:pdECL3G_13w23b, DUT: 53201 SN: 004402/47/428328/4, 004402/47/428329/2, HW: 0103, SW: pdECL3G_13w23b, DUT: 53202
Batteries used in testing	BL-4U, DUT: 52886, 52885, 52887
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 measured SAR value is less than or equal to the limit.

1.2.1 Head Configuration

Mode	Ch / *f*(MHz)	Conducted power	Position	Measured SAR value (1g avg)	Reported* SAR value (1g avg)	SAR limit (1g avg)	Result	Plot#
GSM850	128 / 824.2	32.91 dBm	Left, Cheek	0.816 W/kg	**0.92 W/kg**	1.6 W/kg	PASSED	1
GSM1900	661 / 1880	30.39 dBm	Left, Cheek	0.429 W/kg	**0.48 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	29.90 dBm	1.5cm	0.922 W/kg	**1.03 W/kg**	1.6 W/kg	PASSED	3
4-slot GPRS1900	810 / 1909.8	24.38 dBm	1.5cm	0.601 W/kg	**0.67 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	0.92W/kg	-	-
{Max + Max} Simultaneous Head SAR value	1.24W/kg		
Maximum Body SAR values	1.03W/kg	-	-
{Max + Max} Simultaneous Body SAR value	1.14W/kg		
Maximum Product Specific (Wireless Router) SAR values	-	-	-
{Max + Max} Simultaneous Product Specific SAR value	-		
Maximum Simultaneous SAR value **Body SAR: GSM850 + BT2450****	1.24W/kg		

**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	0.44dB

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	32.5	29.5	27.7	26.5	32.85	29.85	30.05	26.85
	1900			1850 – 1910	30.0	27.0	25.2	24.0	30.35	27.35	25.55	24.35

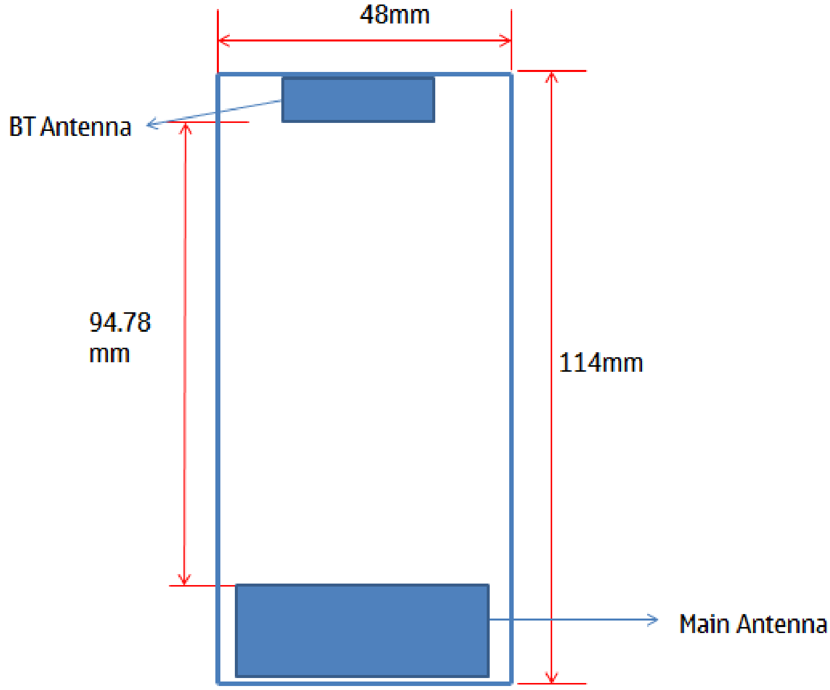
Outside of USA, the transmitter of the device is capable of operating also in GSM/GPRS900, GSM/GPRS1800, WCDMA900 and WCDMA2100 bands which are not part of this filing.

This is a dual-SIM device. As both SIMs use the same antenna and transmitter chain, full evaluation of this device has been made by activating a single SIM only.

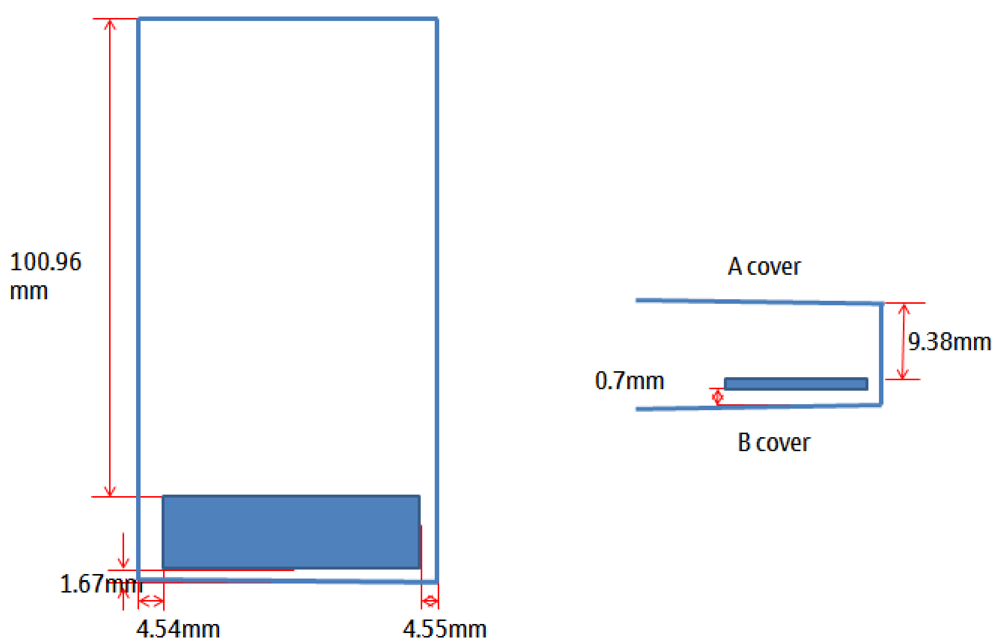
2.1 Description of the Antenna

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

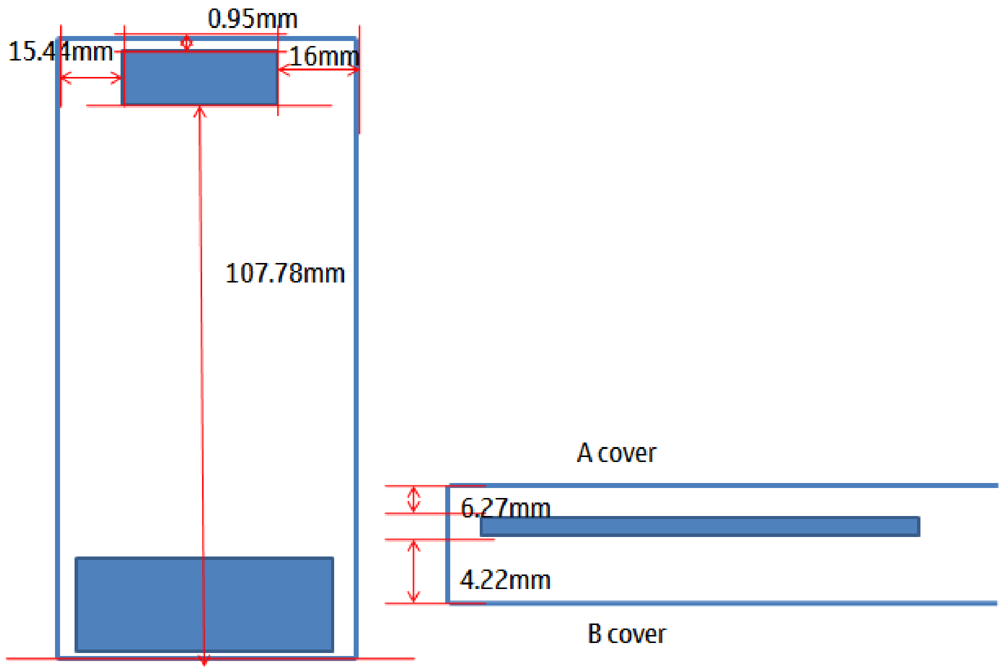
Phone Dimension and Distance Between Main antenna and BT Antenna



Distance between Out of Device and Main Antenna



Distance between Out of Device and BT Antenna



3. TEST CONDITIONS

3.1 Temperature and Humidity

Ambient temperature (°C):	20.5 – 22.5
Ambient humidity (RH %):	35 - 55

3.2 Test Signal, Frequencies and Output Power

The device was put into operation by using a call tester. Communication between the device and the call tester was established by air link.

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

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.

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	2013-03	2014-03
DAE 4	710	2013-03	2014-03
E-field Probe EX3DV4	3838	2013-03	2014-03
E-field Probe EX3DV4	3836	2013-03	2014-03
Dipole Validation Kit, D835V2	479	2013-03	2015-03
Dipole Validation Kit, D835V2	4d005	2012-03	2014-03
Dipole Validation Kit, D1900V2	509	2012-12	2014-12
DASY5 software	Version 52.8	-	-

Additional test equipment used in testing:

Test Equipment	Model	Serial Number	Calibration date	Calibration expiry
Signal Generator	SME06	829445	2013-04	2014-04
Signal Generator	E4432B	US40052231	2013-04	2014-04
Call Tester	CMU200	835352/008	-	-
Call Tester	CMU200	110735	-	-
Amplifier	ZHL-42W	QA1252001	-	-
Amplifier	AR 5S1G4M1	306024	-	-
RF Network Analyzer	8753ES	My40002096	2013-04	2014-04
RF Network Analyzer	8753ES	US39170317	2013-04	2014-04
Dielectric Probe Kit	85070C	2577	-	-
Dielectric Probe Kit	85070C	653	-	-
Power Meter	R&S NRP	101293	2013-04	2014-04
Power Sensor	R&S NRP-Z51	102842	2013-04	2014-04
Power Meter	Agilent E4419B	My41291520	2013-04	2014-04
Power Sensor	Agilent 8482A	US37295411	2013-04	2014-04

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 SAM 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 flat phantom also manufactured by SPEAG; this phantom conform to the requirements of OET Bulletin 65, Supplement C.

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

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 for all system check and device tests, measured from the ear reference point in the case of the SAM phantom and from the inner surface of the flat phantom.

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	51.50	69.25
Tween 20	47.35	30.00
Salt	1.15	0.75

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	V52.8	D835V2 / 4d005	EX3DV4 / 3836	DAE4 / 710	2013-03	2013-03
835	TCC Beijing / SAR-3	V52.8	D835V2 / 479	EX3DV4 / 3838	DAE4 / 1324	2013-03	2013-04
1900	TCC Beijing / SAR-3	V52.8	D1900V2 / 509	EX3DV4 / 3838	DAE4 / 1324	2013-03	2013-04

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 for head system checking, and under the flat phantom for body system checking. 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	Plot #
			εr	1g	dSAR [%]	dεr [%]	dσ [%]	[°C]	
	Tolerances				±10 %	±5 %	±5 %		
835	IEEE1528 / IEC62209		41.5	0.90					
	Reference result SN:479	2.48	40.9	0.94	TCC Beijing/SAR-3 EX3DV4 SN:3838 Head835				
	2013-06-17	2.37	40.4	0.91	-4.44	-1.22	-3.19	20.5	1
	Reference result SN:4d005	2.32	41.5	0.89	TCC Beijing/SAR-1 EX3DV4 SN:3836 Head835				
	2013-06-26	2.11	40.3	0.87	-9.05	-2.89	-2.25	21.5	2
1900	IEEE1528 / IEC62209		40.0	1.40					
	Reference result SN:509	9.63	39.5	1.38	TCC Beijing/SAR-3 EX3DV4 SN:3838 Head1900				
	2013-06-19	9.88	39.5	1.35	2.60	0.00	-2.17	22.5	3

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	Plot #
			εr	σ [S/m]	dSAR [%]	dεr [%]	dσ [%]	[°C]	
	Tolerances				±10 %	±5 %	±5 %		
835	IEEE1528 / IEC62209		55.2	0.97					
	Reference result SN:4d005	2.42	55.0	1.00	TCC Beijing/SAR-1 EX3DV4 SN:3836 Body835				
	2013-06-24	2.50	54.8	0.97	3.31	-0.36	-3.00	22.2	4
	2013-06-25	2.37	54.5	0.97	-2.07	-0.91	-3.00	21.8	5
1900	IEEE1528 / IEC62209		53.3	1.52					
	Reference result SN:509	9.84	52.2	1.52	TCC Beijing/SAR-3 EX3DV4 SN:3838 Body1900				
	2013-06-24	10.6	51.9	1.55	7.72	-0.57	1.97	20.8	6

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]	dε_r [%]	dσ [%]	
	Deviation of tolerances			±5 %	±5 %	
836	Recommended value ± 5% window	41.5 39.4 – 43.6	0.90 0.86 – 0.95			
	2013-06-17	40.4	0.91	-2.65	1.11	20.5
	2013-06-26	40.3	0.87	-2.89	-3.33	21.5
1880	Recommended value ± 5% window	40.0 38.0 – 42.0	1.40 1.33 – 1.47			
	2013-06-19	39.6	1.34	-1.00	-4.29	22.5

Body tissue simulant measurements

f [MHz]	Description	Dielectric Parameters		Dielectric Parameters Deviation from Standard target		Temp [°C]
		ε_r	σ [S/m]	dε_r [%]	dσ [%]	
	Deviation of tolerances			±5 %	±5 %	
836	Recommended value ± 5% window	55.2 52.4 – 58.0	0.97 0.92 – 1.02			
	2013-06-24	54.7	0.98	-0.91	1.03	22.2
	2013-06-25	54.5	0.97	-1.27	0.00	21.8
1880	Recommended value ± 5% window	53.3 50.6 – 56.0	1.52 1.44 – 1.60			
	2013-06-24	52.0	1.53	-2.44	0.66	20.8

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

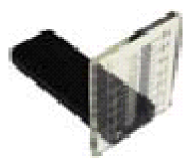
5. DESCRIPTION OF THE TEST PROCEDURE

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 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

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

850MHz Band Head SAR results

Mode	Device orientation	SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Plot #
			Ch 128 824.2 MHz	Ch 190 836.6 MHz	Ch 251 848.8 MHz	Ch 128 824.2 MHz	Ch 190 836.6 MHz	Ch 251 848.8 MHz	
GSM	Tuning Target + Tolerance [dBm]		32.85			Scaling factor*			
	Conducted Power [dBm]		32.91	32.92	32.91	0.50	0.50	0.50	dB
	Time-averaged power [dBm]		23.88	23.89	23.88	1.12	1.12	1.12	Lin
	Left Cheek	Estimated SAR	-	-	-	-	-	-	1
		Full SAR	0.816	0.750	0.724	**0.916**	0.842	0.812	
	Left Tilt	Estimated SAR	-	-	-	-	-	-	-
		Full SAR	-	0.306	-	-	0.343	-	
	Right Cheek	Estimated SAR	-	-	-	-	-	-	-
		Full SAR	0.800	0.736	0.726	0.898	0.826	0.815	
	Right Tilt	Estimated SAR	-	-	-	-	-	-	-
		Full SAR	-	0.305	-	-	0.342	-	
	Repeated SAR	Estimated SAR	-	-	-	-	-	-	-
		Full SAR	0.769	-	-	0.861	-	-	

1900MHz Band Head SAR results

Mode	Device orientation	SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Plot #
			Ch 512 1850.2 MHz	Ch 661 1880.0 MHz	Ch 810 1909.8 MHz	Ch 512 1850.2 MHz	Ch 661 1880.0 MHz	Ch 810 1909.8 MHz	
GSM	Tuning Target + Tolerance [dBm]		30.35			Scaling factor*			
	Conducted Power [dBm]		30.40	30.39	30.41	0.50	0.50	0.50	dB
	Time-averaged power [dBm]		21.37	21.36	21.38	1.12	1.12	1.12	Lin
	Left Cheek	Estimated SAR	-	-	-	-	-	-	2
		Full SAR	0.371	0.429	0.384	0.416	**0.481**	0.431	
	Left Tilt	Estimated SAR	-	-	-	-	-	-	-
		Full SAR	-	0.143	-	-	0.160	-	
	Right Cheek	Estimated SAR	-	-	-	-	-	-	-
		Full SAR	-	0.342	-	-	0.384	-	
	Right Tilt	Estimated SAR	-	-	-	-	-	-	-
		Full SAR	-	0.168	-	-	0.188	-	

Note:
* 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.

Highest result within individual zoom scan or individual expanded zoom scan results is given in Section 1.2 for each transmitter. Highest result within contributing individual zoom scan, individual expanded zoom scan, Speag combined algorithm or combined expanded zoom scan results are given in Section for each simultaneous transmitter combination.

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

Test configuration	Max. 1g SAR results		
	BT2450	GSM850	GSM1900
Head: Left, Cheek	0.32†	0.916	0.481
Head: Left, Tilt	0.32†	0.343	0.160
Head: Right, Cheek	0.32†	0.898	0.384
Head: Right, Tilt	0.32†	0.342	0.188

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

	Max. 1g SAR results	
Test configuration	GSM850+BT2450†	GSM1900+BT2450†
Head: Left, Cheek	**1.24**	**0.801**
Head: Left, Tilt	0.663	0.480
Head: Right, Cheek	1.22	0.704
Head: Right, Tilt	0.662	0.508

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

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

850MHz Band Body SAR results

Mode	Device orientation		SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Plot #
				Ch 128 824.2 MHz	Ch 190 836.6 MHz	Ch 251 848.8 MHz	Ch 128 824.2 MHz	Ch 190 836.6 MHz	Ch 251 848.8 MHz	
1-slot GPRS	Tuning Target + Tolerance [dBm]			32.85			Scaling factor*			
	Conducted Slot Average Power [dBm]			32.91	32.92	32.91	0.50	0.50	0.50	dB
	Time-averaged power [dBm]			23.88	23.89	23.88	1.12	1.12	1.12	Lin
	Back facing phantom	Without headset	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	0.837	0.777	0.720	0.937	0.870	0.806	
		Headset WH-108	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	-	-	-	-	-	
	Display facing phantom	Without headset	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	-	-	-	-	-	
		Headset WH-108	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	-	-	-	-	-	
2-slot GPRS	Tuning Target + Tolerance [dBm]			29.85			Scaling factor*			
	Conducted Slot Average Power [dBm]			29.90	29.89	29.91	0.50	0.50	0.50	dB
	Time-averaged power [dBm]			23.88	23.87	23.89	1.12	1.12	1.12	Lin
	Back facing phantom	Without headset	Estimated SAR	-	-	-	-	-	-	3
			Full SAR	0.922	0.785	0.819	1.03	0.879	0.917	
		Headset WH-108	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	-	-	-	-	-	
	Display facing phantom	Without headset	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	-	-	-	-	-	
		Headset WH-108	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	-	-	-	-	-	
3-slot GPRS	Tuning Target + Tolerance [dBm]			28.05			Scaling factor*			
	Conducted Slot Average Power [dBm]			28.08	28.05	28.08	0.50	0.50	0.50	dB
	Time-averaged power [dBm]			23.82	23.79	23.82	1.12	1.12	1.12	Lin
	Back facing phantom	Without headset	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	0.844	0.806	0.802	0.945	0.903	0.898	
		Headset WH-108	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	-	-	-	-	-	
	Display facing phantom	Without headset	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	-	-	-	-	-	
		Headset WH-108	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	-	-	-	-	-	

(850MHz Body SAR Table continues)

(850MHz Body SAR Table continues)

Mode	Device orientation		SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Plot #
				Ch 128 824.2 MHz	Ch 190 836.6 MHz	Ch 251 848.8 MHz	Ch 128 824.2 MHz	Ch 190 836.6 MHz	Ch 251 848.8 MHz	
4-slot GPRS	Tuning Target + Tolerance [dBm]			26.85			Scaling factor*			
	Conducted Slot Average Power [dBm]			26.90	26.92	26.93	0.50	0.50	0.50	dB
	Time-averaged power [dBm]			23.89	23.91	23.92	1.12	1.12	1.12	Lin
	Back facing phantom	Without headset	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	0.822	0.809	0.749	0.921	0.906	0.839	
		Headset WH-108	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	0.737	-	-	0.825	-	
	Display facing phantom	Without headset	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	0.635	-	-	0.711	-	
		Headset WH-108	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	0.579	-	-	0.648	-	
	Repeated SAR		Estimated SAR	-	-	-	-	-	-	-
			Full SAR	0.917	-	-	1.03	-	-	

1900MHz Band Body SAR results

Mode	Device orientation		SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Plot #
				Ch 512 1850.2 MHz	Ch 661 1880.0 MHz	Ch 810 1909.8 MHz	Ch 512 1850.2 MHz	Ch 661 1880.0 MHz	Ch 810 1909.8 MHz	
1-slot GPRS	Tuning Target + Tolerance [dBm]			30.35			Scaling factor*			
	Conducted Slot Average Power [dBm]			30.40	30.39	30.41	0.50	0.50	0.50	dB
	Time-averaged power [dBm]			21.37	21.36	21.38	1.12	1.12	1.12	Lin
	Back facing phantom	Without headset	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	0.402	-	-	0.451	-	
		Headset WH-108	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	-	-	-	-	-	
	Display facing phantom	Without headset	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	-	-	-	-	-	
		Headset WH-108	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	-	-	-	-	-	
2-slot GPRS	Tuning Target + Tolerance [dBm]			27.35			Scaling factor*			
	Conducted Slot Average Power [dBm]			27.39	27.40	27.35	0.50	0.50	0.50	dB
	Time-averaged power [dBm]			21.37	21.38	21.33	1.12	1.12	1.12	Lin
	Back facing phantom	Without headset	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	0.537	-	-	0.603	-	
		Headset WH-108	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	-	-	-	-	-	
	Display facing phantom	Without headset	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	-	-	-	-	-	
		Headset WH-108	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	-	-	-	-	-	
3-slot GPRS	Tuning Target + Tolerance [dBm]			25.55			Scaling factor*			
	Conducted Slot Average Power [dBm]			25.60	25.61	25.64	0.50	0.50	0.50	dB
	Time-averaged power [dBm]			21.34	21.35	21.38	1.12	1.12	1.12	Lin
	Back facing phantom	Without headset	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	0.544	-	-	0.609	-	
		Headset WH-108	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	-	-	-	-	-	
	Display facing phantom	Without headset	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	-	-	-	-	-	
		Headset WH-108	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	-	-	-	-	-	

(1900MHz Body SAR Table continues)

(1900MHz Body SAR Table continues)

Mode	Device orientation		SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Plot #
				Ch 512 1850.2 MHz	Ch 661 1880.0 MHz	Ch 810 1909.8 MHz	Ch 512 1850.2 MHz	Ch 661 1880.0 MHz	Ch 810 1909.8 MHz	
4-slot GPRS	Tuning Target + Tolerance [dBm]			24.35			Scaling factor*			
	Conducted Slot Average Power [dBm]			24.40	24.42	24.38	0.50	0.50	0.50	dB
	Time-averaged power [dBm]			21.39	21.41	21.37	1.12	1.12	1.12	Lin
	Back facing phantom	Without headset	Estimated SAR	-	-	-	-	-	-	4
			Full SAR	0.569	0.594	0.601	0.638	0.666	**0.674**	
		Headset WH-108	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	0.575	-	-	0.645	-	
	Display facing phantom	Without headset	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	0.331	-	-	0.371	-	
		Headset WH-108	Estimated SAR	-	-	-	-	-	-	-
			Full SAR	-	0.313	-	-	0.351	-	

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

Test configuration	Max. 1g SAR results		
	BT2450	2-slot GPRS850	4-slot GPRS1900
Body: Back facing phantom, Without Headset	0.11†	1.03	0.674
Body: Back facing phantom, Headset WH-109	0.11†	0.825	0.645
Body: Display facing phantom, Without Headset	0.11†	0.711	0.371
Body: Display facing phantom, Headset WH-109	0.11†	0.648	0.351

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

	Max. 1g SAR results	
Test configuration	2-slot GPRS850 +BT2450†	4-slot GPRS1900 +BT2450†
Body: Back facing phantom, Without Headset	**1.14**	**0.784**
Body: Back facing phantom, Headset WH-109	0.935	0.656
Body: Display facing phantom, Without Headset	0.821	0.382
Body: Display facing phantom, Headset WH-109	0.758	0.362

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

Note:
* 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.

Highest result within individual zoom scan or individual expanded zoom scan results is given in Section 1.2 for each transmitter. Highest result within contributing individual zoom scan, individual expanded zoom scan, Speag combined algorithm or combined expanded zoom scan results are given in Section for each simultaneous transmitter combination.

Plots of the Measurement scans are given in Appendix B.

APPENDIX A: SYSTEM CHECKING SCANS

Plot1:

Date/Time: 2013-06-17 9:50:39

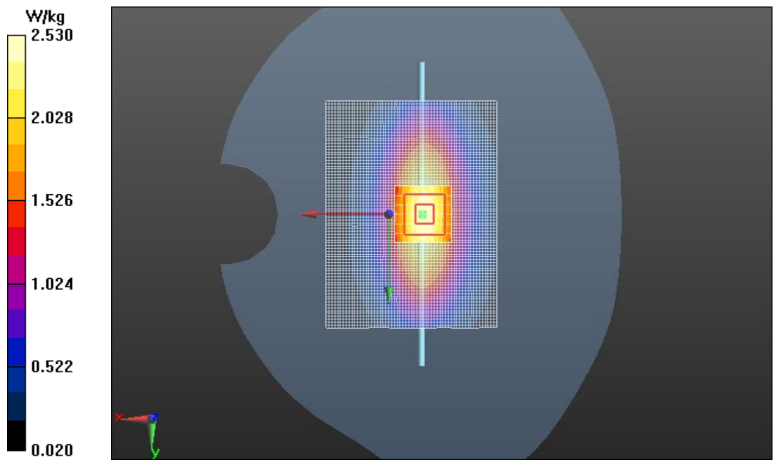
Test Laboratory: TCC Nokia
Type: D835V2; Serial: 479

Communication System: CW835
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: Head 835; Medium Notes: Medium Temperature: t= 20.5 C
Medium parameters used: f = 835 MHz; σ = 0.906 S/m; ε_r = 40.427; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY Configuration:
- Probe: EX3DV4 - SN3838
- ConvF(9.04, 9.04, 9.04); Calibrated: 2013-03-08;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2013-03-06
- Phantom: SAM9; Type: SAM; Serial:
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

d=15mm, Pin=250mW/Area Scan (61x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 2.53 W/kg

d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.042 V/m
Peak SAR (extrapolated) = 3.52 W/kg
SAR(1 g) = 2.37 W/kg
SAR(10 g) = 1.55 W/kg
Power Drift = 0.02 dB
Maximum value of SAR (measured) = 2.55 W/kg



Plot2:

Date/Time: 2013-06-26 9:19:33

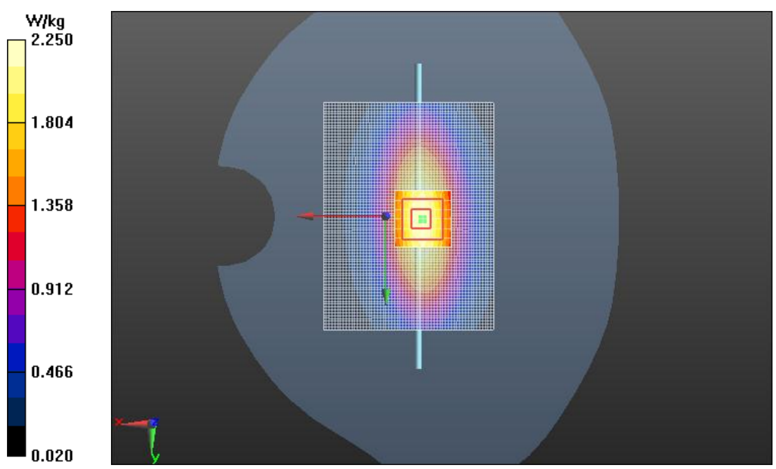
Test Laboratory: TCC Nokia
Type: D835V2; Serial: 4d005

Communication System: CW835
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: Head 835; Medium Notes: Medium Temperature: t= 21.5 C
Medium parameters used: f = 835 MHz; σ = 0.865 S/m; ε_r = 40.31; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY Configuration:
- Probe: EX3DV4 - SN3836
- ConvF(9.03, 9.03, 9.03); Calibrated: 2013-03-08;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn710; Calibrated: 2013-03-08
- Phantom: SAM1; Type: SAM; Serial: TP - 01097
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

d=15mm, Pin=250mW/Area Scan (61x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 2.25 W/kg

d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 51.834 V/m
Peak SAR (extrapolated) = 3.19 W/kg
SAR(1 g) = 2.11 W/kg
SAR(10 g) = 1.38 W/kg
Power Drift = -0.11 dB
Maximum value of SAR (measured) = 2.28 W/kg



Plot3:

Date/Time: 2013-06-19 9:48:20

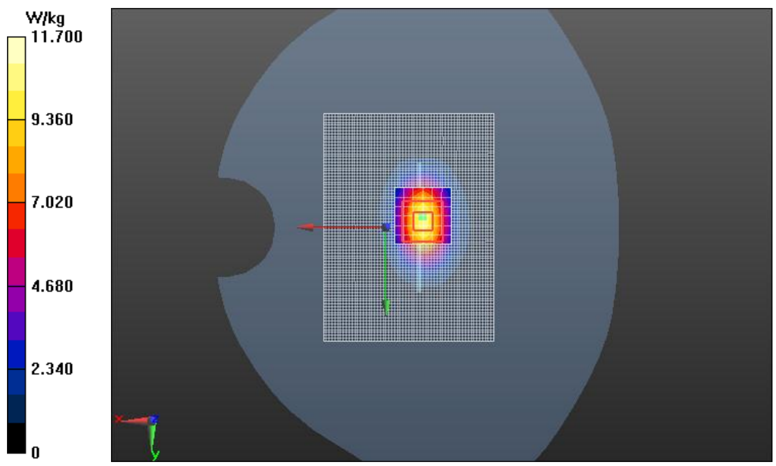
Test Laboratory: TCC Nokia
Type: D1900V2; Serial: 509

Communication System: CW1900
Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: Head 1900; Medium Notes: Medium Temperature: t=22.5 C
Medium parameters used: f = 1900 MHz; σ = 1.351 S/m; ε_r = 39.515; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY Configuration:
- Probe: EX3DV4 - SN3838
- ConvF(7.46, 7.46, 7.46); Calibrated: 2013-03-08;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2013-03-06
- Phantom: SAM10; Type: SAM; Serial:
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

d=10mm, Pin=250mW/Area Scan (61x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 11.7 W/kg

d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 87.040 V/m
Peak SAR (extrapolated) = 18.0 W/kg
SAR(1 g) = 9.88 W/kg
SAR(10 g) = 5.21 W/kg
Power Drift = 0.09 dB
Maximum value of SAR (measured) = 11.0 W/kg



Plot4:

Date/Time: 2013-06-24 9:51:40

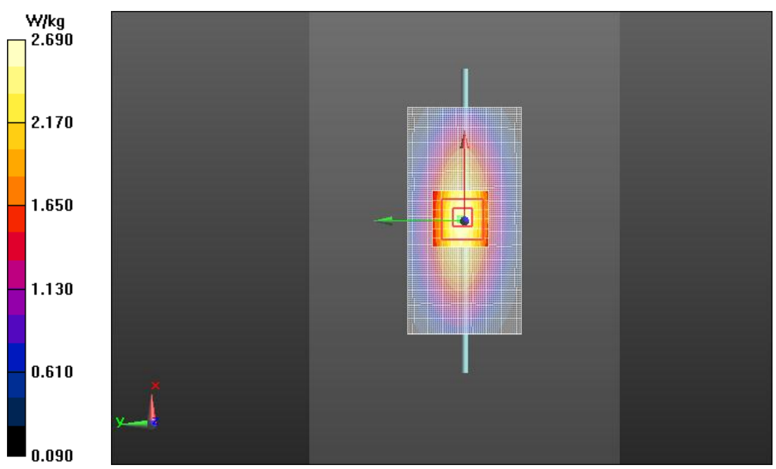
Test Laboratory: TCC Nokia
Type: D835V2; Serial: 4d005

Communication System: CW835
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: Body 835; Medium Notes: Medium Temperature: t= 22.2C
Medium parameters used: f = 835 MHz; σ = 0.973 S/m; ε_r = 54.798; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY Configuration:
- Probe: EX3DV4 - SN3836
- ConvF(8.97, 8.97, 8.97); Calibrated: 2013-03-08;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn710; Calibrated: 2013-03-08
- Phantom: TFP3; Type: QD 000 P51 CA; Serial: 1130
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

d=15mm, Pin=250mW/Area Scan (121x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 2.69 W/kg

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.464 V/m
Peak SAR (extrapolated) = 3.69 W/kg
SAR(1 g) = 2.5 W/kg
SAR(10 g) = 1.65 W/kg
Power Drift = 0.00 dB
Maximum value of SAR (measured) = 2.69 W/kg



Plot5:

Date/Time: 2013-06-25 8:59:10

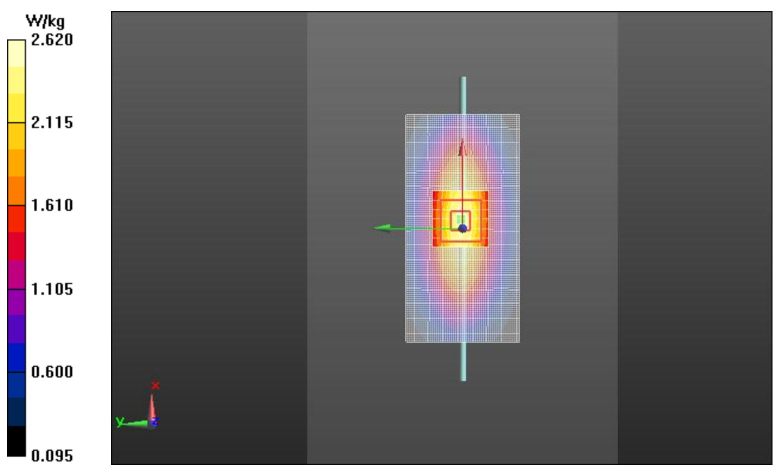
Test Laboratory: TCC Nokia
Type: D835V2; Serial: 4d005

Communication System: CW835
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: Body 835; Medium Notes: Medium Temperature: t= 21.8C
Medium parameters used: f = 835 MHz; σ = 0.972 S/m; ε_r = 54.487; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY Configuration:
- Probe: EX3DV4 - SN3836
- ConvF(8.97, 8.97, 8.97); Calibrated: 2013-03-08;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn710; Calibrated: 2013-03-08
- Phantom: TFP3; Type: QD 000 P51 CA; Serial: 1130
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

d=15mm, Pin=250mW/Area Scan (121x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 2.62 W/kg

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.032 V/m
Peak SAR (extrapolated) = 3.54 W/kg
SAR(1 g) = 2.37 W/kg
SAR(10 g) = 1.56 W/kg
Power Drift = -0.19 dB
Maximum value of SAR (measured) = 2.56 W/kg



Plot6:

Date/Time: 2013-06-24 10:59:33

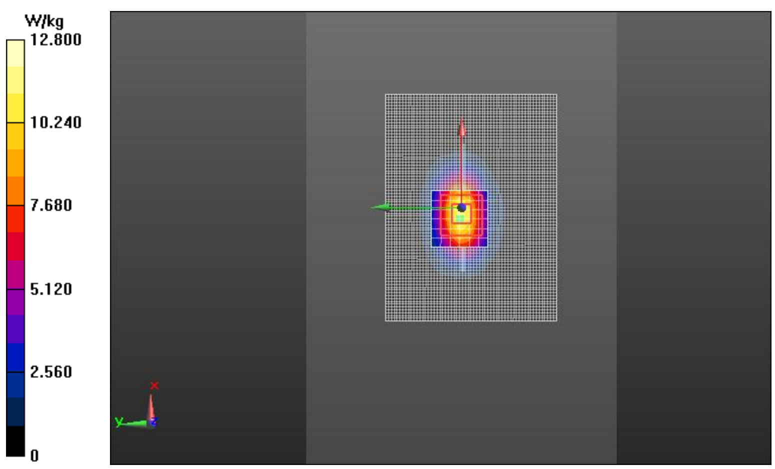
Test Laboratory: TCC Nokia
Type: D1900V2; Serial: 509

Communication System: CW1900
Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: Body 1900; Medium Notes: Medium Temperature: t=20.8 C
Medium parameters used: f = 1900 MHz; σ = 1.547 S/m; ε_r = 51.875; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY Configuration:
- Probe: EX3DV4 - SN3838
- ConvF(7.21, 7.21, 7.21); Calibrated: 2013-03-08;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2013-03-06
- Phantom: TFP3 SAR3; Type:; Serial:
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

d=10mm, Pin=250mW/Area Scan (81x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 12.8 W/kg

d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 86.649 V/m
Peak SAR (extrapolated) = 19.1 W/kg
SAR(1 g) = 10.6 W/kg
SAR(10 g) = 5.52 W/kg
Power Drift = 0.02 dB
Maximum value of SAR (measured) = 11.8 W/kg



APPENDIX B: MEASUREMENT SCANS

Plot1:

Date/Time: 2013-06-17 11:51:31

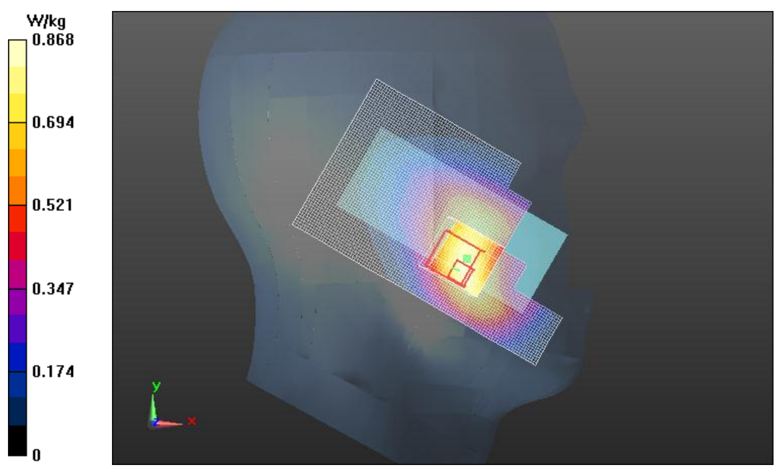
Test Laboratory: TCC Nokia
Type: RM-952; Serial: 004402/47/428328/4, 004402/47428329/2

Communication System: GSM850
Frequency: 824.2 MHz; Duty Cycle: 1:8.30042
Medium: Head 835; Medium Notes: Medium Temperature: t= 20.5 C
Medium parameters used (interpolated): f = 824.2 MHz; σ = 0.9 S/m; ε_r = 40.509; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY Configuration:
- Probe: EX3DV4 - SN3838
- ConvF(9.04, 9.04, 9.04); Calibrated: 2013-03-08;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2013-03-06
- Phantom: SAM9; Type: SAM; Serial:
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

GSM850 - Left/Cheek - Low/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.868 W/kg

GSM850 - Left/Cheek - Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 10.007 V/m
Peak SAR (extrapolated) = 1.27 W/kg
SAR(1 g) = 0.816 W/kg
SAR(10 g) = 0.524 W/kg
Power Drift = 0.15 dB
Maximum value of SAR (measured) = 0.880 W/kg



Plot2:

Date/Time: 2013-06-19 10:19:16

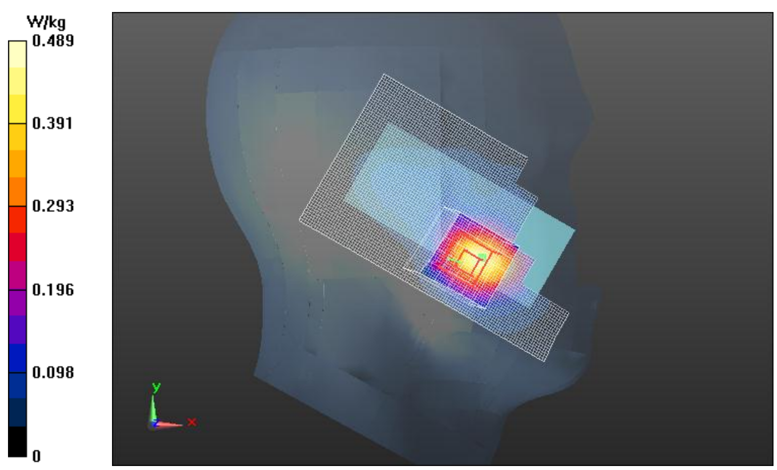
Test Laboratory: TCC Nokia
Type: RM-952; Serial: 004402/47/428328/4, 004402/47428329/2

Communication System: GSM1900
Frequency: 1880 MHz; Duty Cycle: 1:8.30042
Medium: Head 1900; Medium Notes: Medium Temperature: t=22.5 C
Medium parameters used: f = 1880 MHz; σ = 1.335 S/m; ε_r = 39.597; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY Configuration:
- Probe: EX3DV4 - SN3838
- ConvF(7.46, 7.46, 7.46); Calibrated: 2013-03-08;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2013-03-06
- Phantom: SAM10; Type: SAM; Serial:
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

GSM1900 - Left/Cheek - Middle/Area Scan (61x101x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.489 W/kg

GSM1900 - Left/Cheek - Middle/Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 12.684 V/m
Peak SAR (extrapolated) = 0.668 W/kg
SAR(1 g) = 0.429 W/kg
SAR(10 g) = 0.260 W/kg
Power Drift = 0.01 dB
Maximum value of SAR (measured) = 0.459 W/kg



Plot3:

Date/Time: 2013-06-25 13:09:38

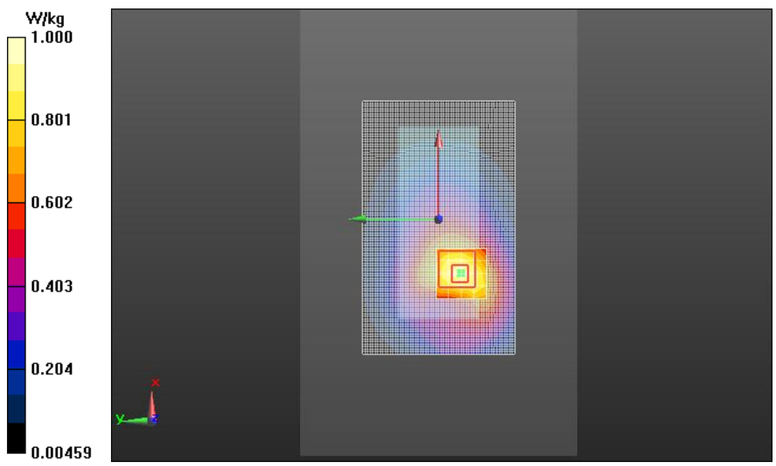
Test Laboratory: TCC Nokia
Type: RM-952; Serial: 004402/47/428328/4,004402/47428329/2

Communication System: 2-slot GPRS850
Frequency: 824.2 MHz; Duty Cycle: 1:4.19952
Medium: Body 850; Medium Notes: Medium Temperature: t=21.8 C
Medium parameters used (interpolated): f = 824.2 MHz; $\sigma = 0.964$ S/m; $\varepsilon_r = 54.597$; $\rho = 1000$ kg/m^3
Phantom section: Center Section

DASY Configuration:
- Probe: EX3DV4 - SN3836
- ConvF(8.97, 8.97, 8.97); Calibrated: 2013-03-08;
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn710; Calibrated: 2013-03-08
- Phantom: TFP3; Type: QD 000 P51 CA; Serial: 1130
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

2-slot GPRS850/Body - Low - Spacer 15mm - No Headset - Back Facing Phantom/Area Scan (61x101x1):
Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.00 W/kg

2-slot GPRS850/Body - Low - Spacer 15mm - No Headset - Back Facing Phantom/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 22.711 V/m
Peak SAR (extrapolated) = 1.37 W/kg
SAR(1 g) = 0.922 W/kg
SAR(10 g) = 0.623 W/kg
Power Drift = 0.02 dB
Maximum value of SAR (measured) = 0.986 W/kg



Plot4:

Date/Time: 2013-06-24 16:17:01

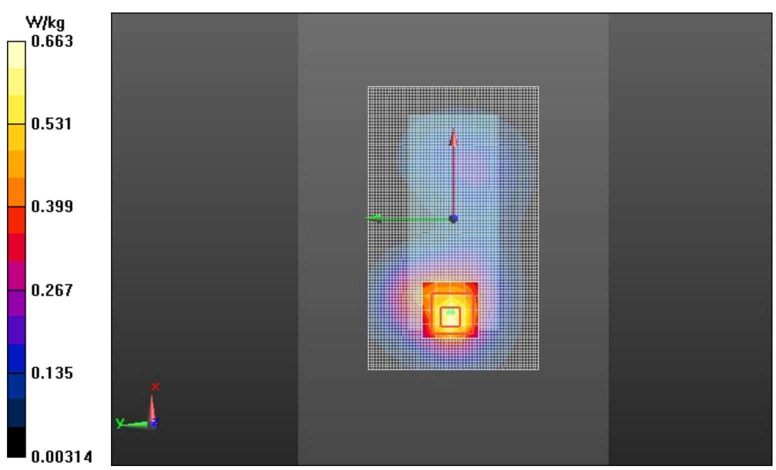
Test Laboratory: TCC Nokia
Type: RM-952; Serial: 004402/47/428200/5, 004402/47/428201/3

Communication System: 4-slot GPRS1900
Frequency: 1909.8 MHz; Duty Cycle: 1:2.08018
Medium: Body 1900; Medium Notes: Medium Temperature: t=20.8 C
Medium parameters used: f = 1910 MHz; σ = 1.56 S/m; ε_r = 51.842; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY Configuration:
- Probe: EX3DV4 - SN3838
- ConvF(7.21, 7.21, 7.21); Calibrated: 2013-03-08;
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1324; Calibrated: 2013-03-06
- Phantom: TFP3 SAR3; Type:; Serial:
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

4-Slot GPRS1900/Body - High - Spacer 15mm - No Headset - Back Facing Phantom/Area Scan (61x101x1):
Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.663 W/kg

4-Slot GPRS1900/Body - High - Spacer 15mm - No Headset - Back Facing Phantom/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 3.758 V/m
Peak SAR (extrapolated) = 0.905 W/kg
SAR(1 g) = 0.601 W/kg
SAR(10 g) = 0.360 W/kg
Power Drift = 0.11 dB
Maximum value of SAR (measured) = 0.649 W/kg



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	
		ε_r	σ [S/m]	ε_r	σ [S/m]	ε_r	σ [S/m]
GSM/GPRS/ EGPRS850	2013-06-17	40.5	0.90	40.4	0.91	40.3	0.92
	2013-06-26	40.4	0.85	40.3	0.87	40.1	0.88
f (MHz)	Date	Dielectric Parameters					
		1850.0MHz		1880.0MHz		1910.0MHz	
		ε_r	σ [S/m]	ε_r	σ [S/m]	ε_r	σ [S/m]
GSM/GPRS/ EGPRS1900	2013-06-19	39.7	1.31	39.6	1.33	39.5	1.36

Body tissue simulant dielectric parameters used in the measurements:

f (MHz)	Date	Dielectric Parameters					
		824.2MHz		837.0MHz		849.0MHz	
		ε_r	σ [S/m]	ε_r	σ [S/m]	ε_r	σ [S/m]
GSM/GPRS/ EGPRS850	2013-06-24	54.9	0.96	54.7	0.97	54.6	0.98
	2013-06-25	54.6	0.96	54.5	0.97	54.3	0.98
f (MHz)	Date	Dielectric Parameters					
		1850.0MHz		1880.0MHz		1910.0MHz	
		ε_r	σ [S/m]	ε_r	σ [S/m]	ε_r	σ [S/m]
GSM/GPRS/ EGPRS1900	2013-06-24	52.0	1.50	51.9	1.53	51.8	1.56

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: **EX3-3838_Mar13**

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: March 8, 2013

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	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	31-Jan-13 (No. DAE4-660_Jan13)	Jan-14
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: March 11, 2013

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (μV/(V/m)^2)[A]	0.37	0.60	0.53	± 10.1 %
DCP (mV)[B]	105.0	99.6	100.1	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	147.3	±3.5 %
		Y	0.0	0.0	1.0		139.3	
		Z	0.0	0.0	1.0		128.2	

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	9.04	9.04	9.04	0.20	1.34	± 12.0 %
1750	40.1	1.37	7.65	7.65	7.65	0.56	0.79	± 12.0 %
1900	40.0	1.40	7.46	7.46	7.46	0.80	0.65	± 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.

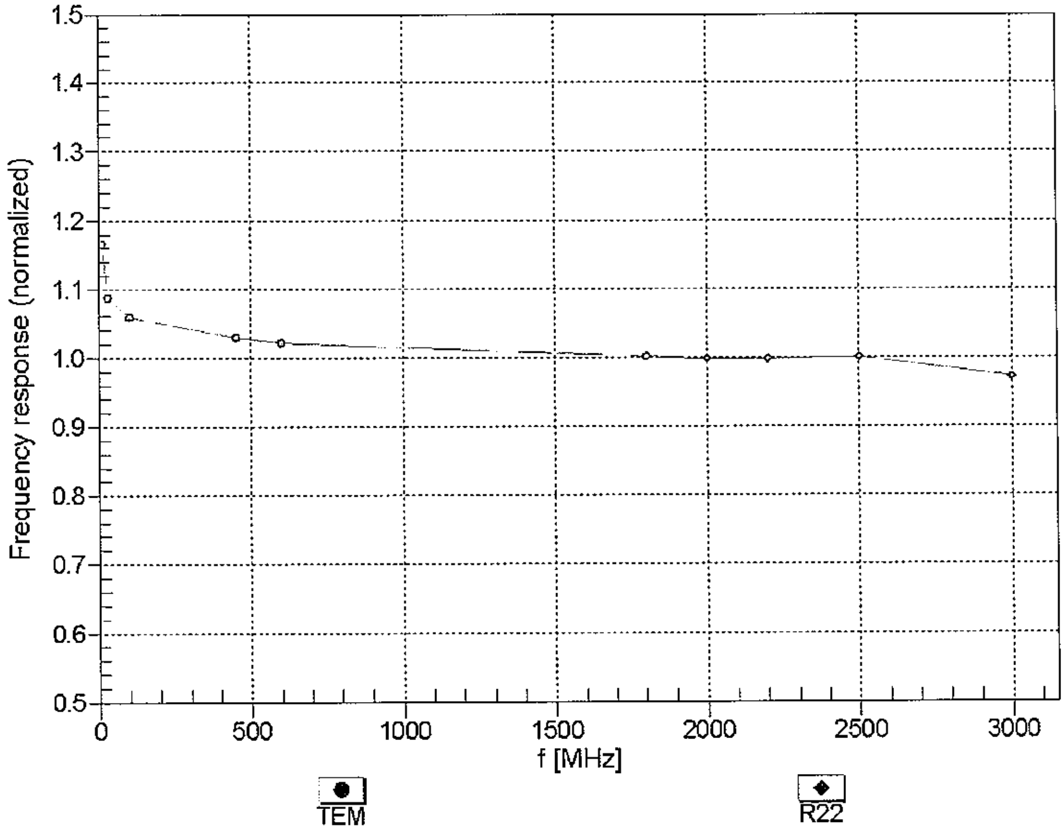
DASY/EASY - Parameters of Probe: EX3DV4 - SN:3838

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	9.07	9.07	9.07	0.27	1.22	± 12.0 %
1750	53.4	1.49	7.54	7.54	7.54	0.35	0.98	± 12.0 %
1900	53.3	1.52	7.21	7.21	7.21	0.30	1.04	± 12.0 %

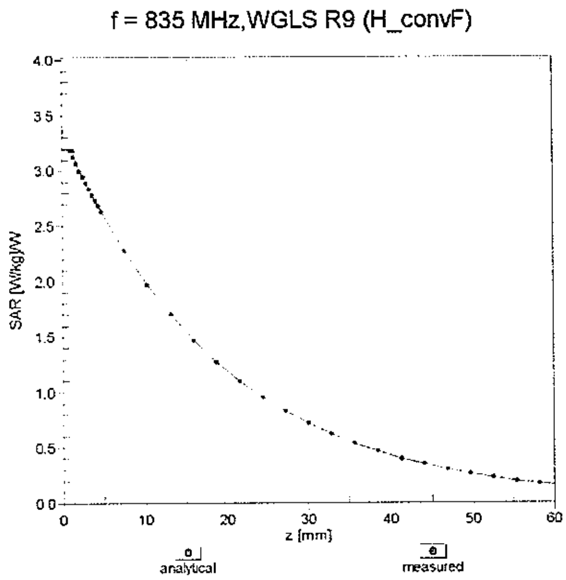
[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of 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.

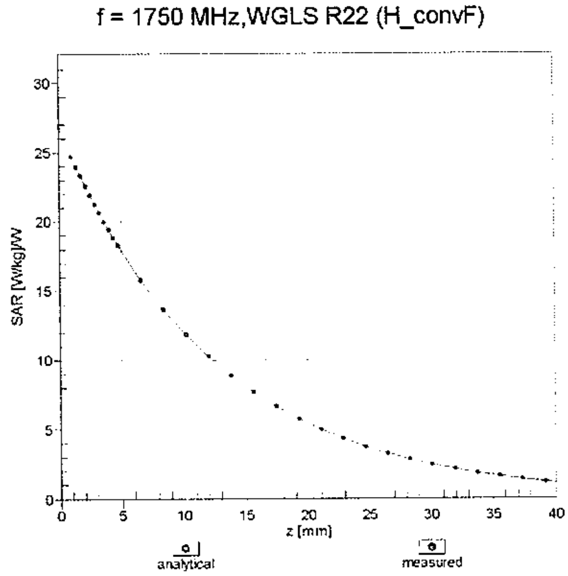
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



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

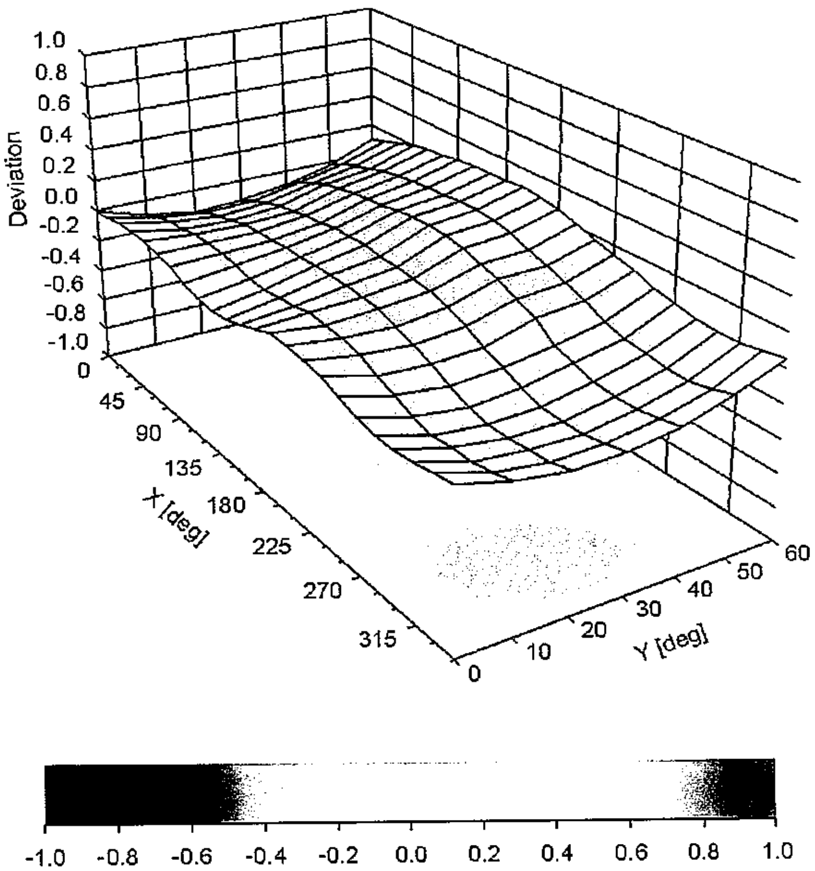
Conversion Factor Assessment





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
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: **EX3-3836_Mar13**

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3836
Calibration procedure(s)	QA CAL-01.v8, QA CAL-23.v4, QA CAL-25.v4 Calibration procedure for dosimetric E-field probes
Calibration date:	March 8, 2013

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	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	31-Jan-13 (No. DAE4-660_Jan13)	Jan-14
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: March 8, 2013

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3836

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (µV/(V/m)^2)[A]	0.40	0.47	0.45	± 10.1 %
DCP (mV)[B]	89.8	101.7	96.3	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√µV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	143.5	±3.0 %
		Y	0.0	0.0	1.0		155.5	
		Z	0.0	0.0	1.0		149.3	

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:3836

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)
750	41.9	0.89	9.44	9.44	9.44	0.80	0.60	± 12.0 %
835	41.5	0.90	9.03	9.03	9.03	0.79	0.60	± 12.0 %
1750	40.1	1.37	8.11	8.11	8.11	0.31	0.98	± 12.0 %
1900	40.0	1.40	7.79	7.79	7.79	0.35	0.92	± 12.0 %
2600	39.0	1.96	6.82	6.82	6.82	0.42	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.

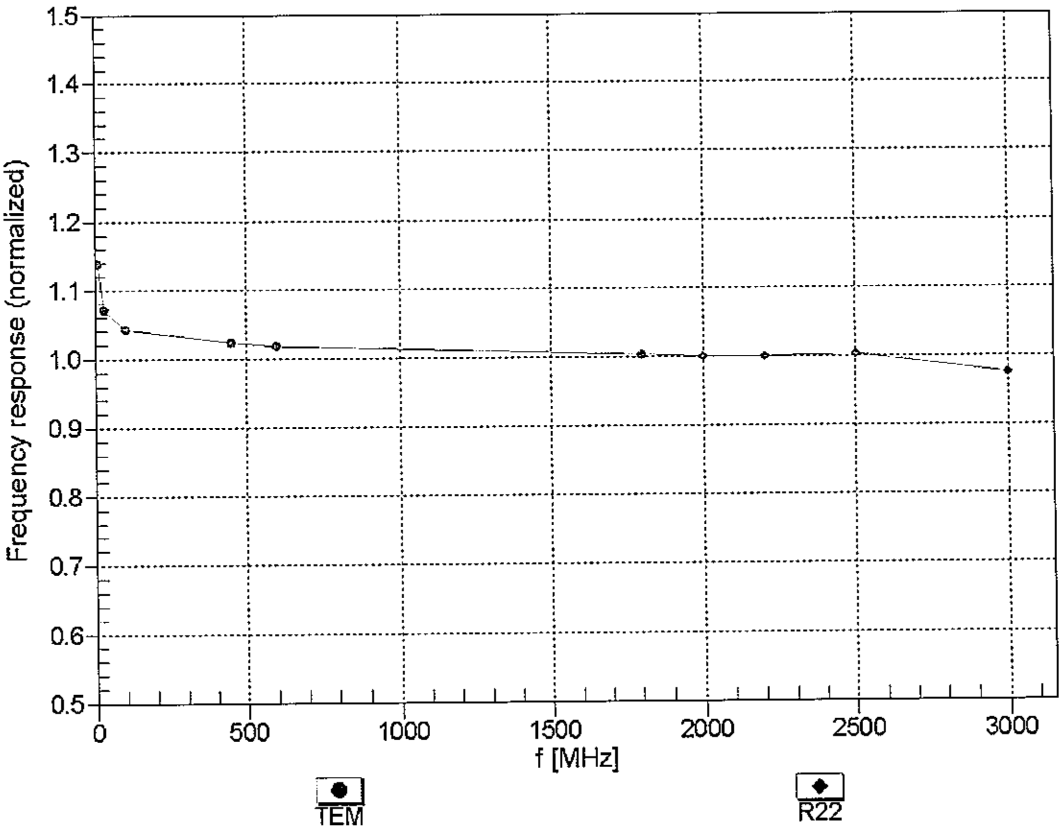
DASY/EASY - Parameters of Probe: EX3DV4 - SN:3836

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)
750	55.5	0.96	9.07	9.07	9.07	0.80	0.61	± 12.0 %
835	55.2	0.97	8.97	8.97	8.97	0.70	0.67	± 12.0 %
1750	53.4	1.49	7.57	7.57	7.57	0.67	0.67	± 12.0 %
1900	53.3	1.52	7.18	7.18	7.18	0.80	0.61	± 12.0 %
2600	52.5	2.16	6.70	6.70	6.70	0.64	0.50	± 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.

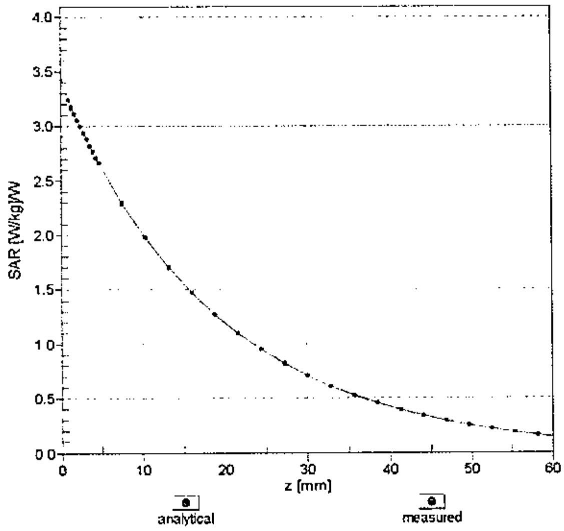
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



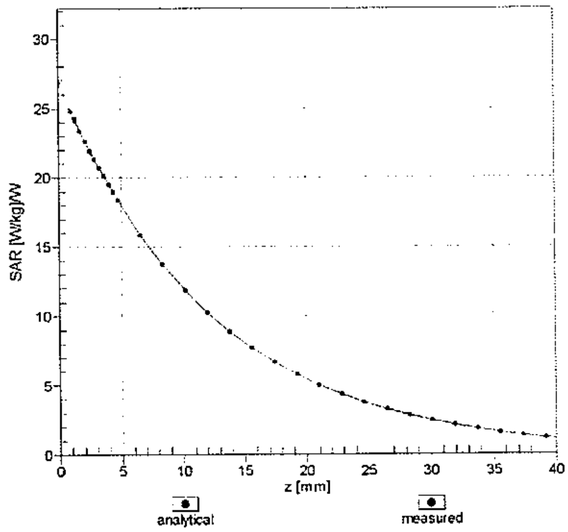
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

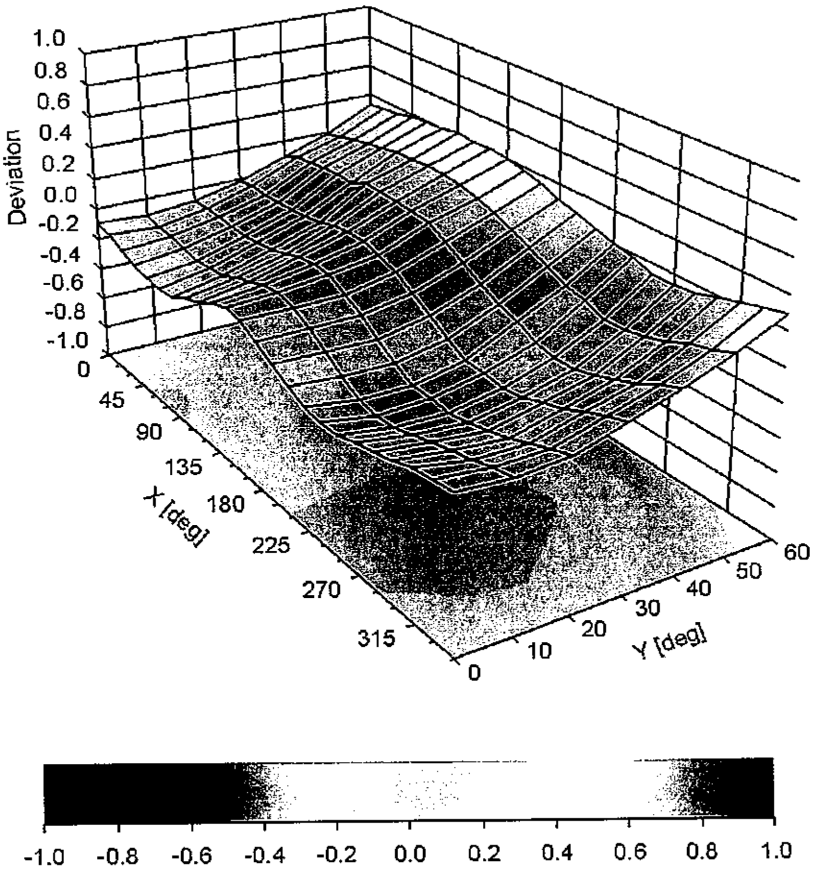


f = 1750 MHz,WGLS R22 (H_convF)



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: D835V2-479_Mar13

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 479
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	March 11, 2013

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	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.3 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13

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-12)	In house check: Oct-13

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

Issued: March 11, 2013

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.6 Ω - 3.7 jΩ
Return Loss	- 28.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.7 Ω - 5.7 jΩ
Return Loss	- 23.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.386 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	January 28, 2003

DASY5 Validation Report for Head TSL

Date: 05.03.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

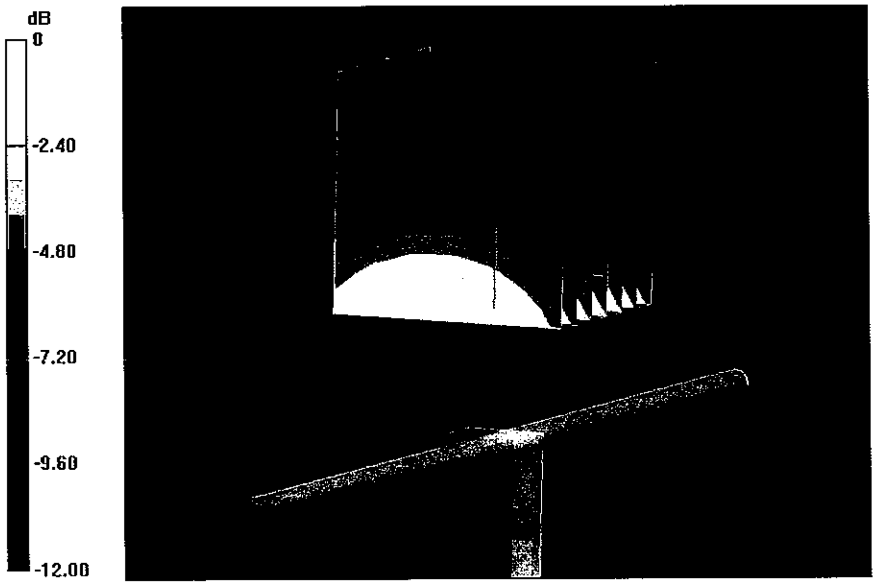
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.94 S/m; ε_r = 40.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.05, 6.05, 6.05); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

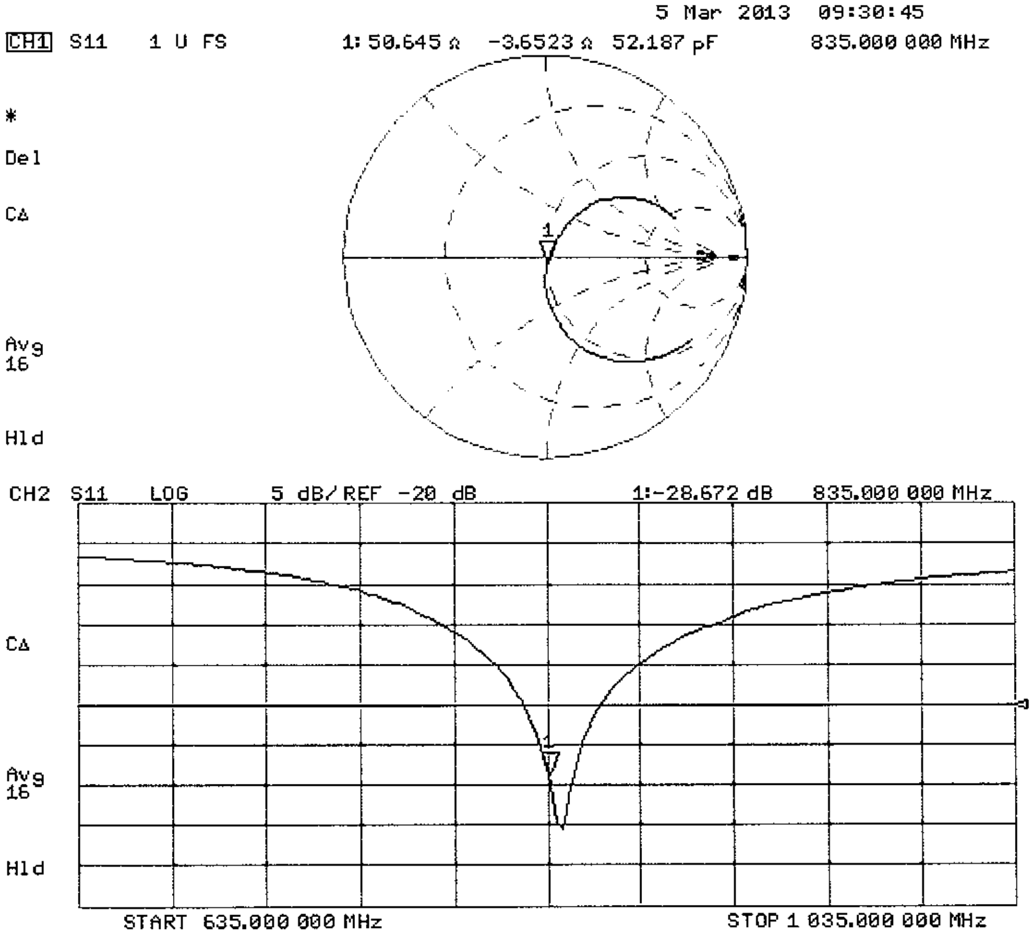
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.333 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.75 W/kg
SAR(1 g) = 2.48 W/kg; SAR(10 g) = 1.6 W/kg
Maximum value of SAR (measured) = 2.91 W/kg



0 dB = 2.91 W/kg = 4.64 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 11.03.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

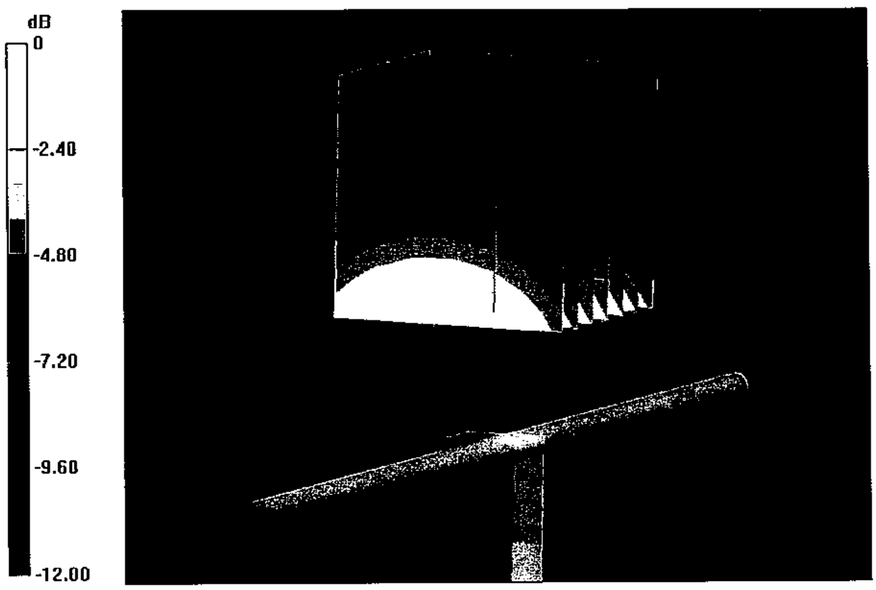
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; $\sigma = 1.02$ S/m; $\varepsilon_r = 54.1$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.04, 6.04, 6.04); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

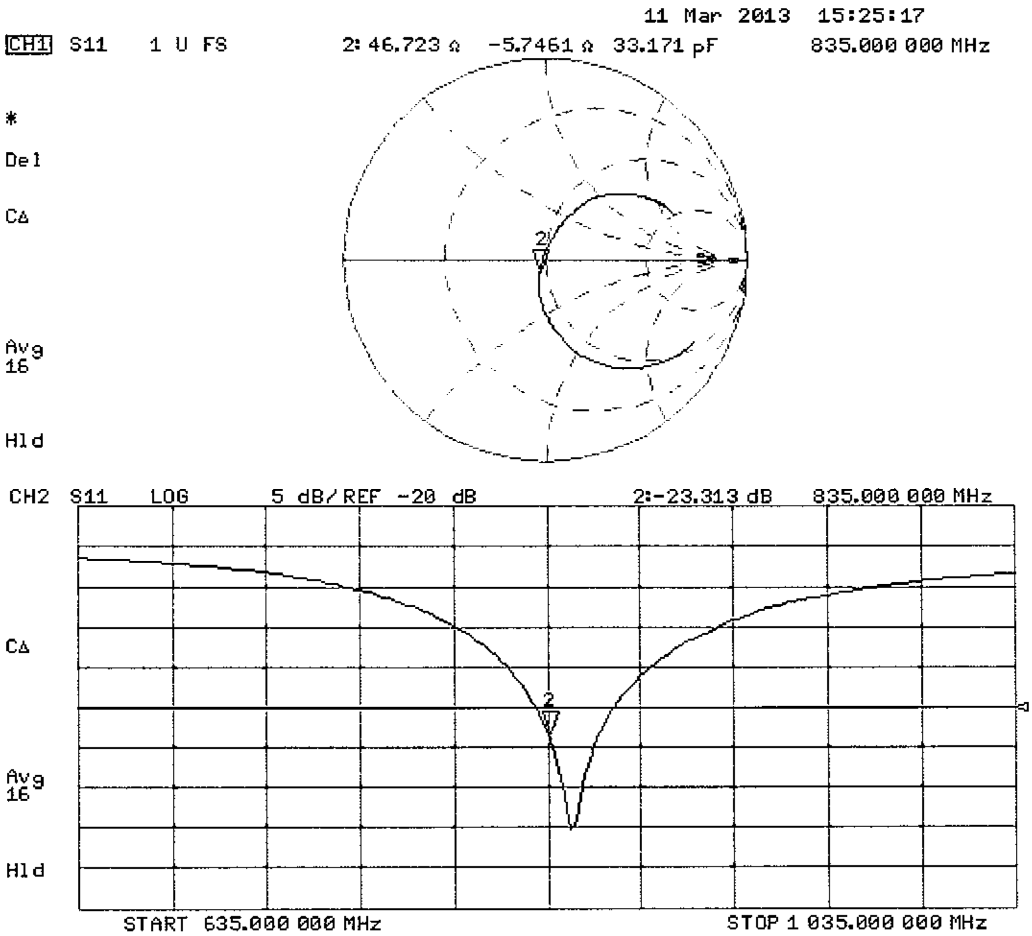
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.333 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 3.71 W/kg
SAR(1 g) = 2.52 W/kg; SAR(10 g) = 1.64 W/kg
Maximum value of SAR (measured) = 2.91 W/kg



0 dB = 2.91 W/kg = 4.64 dBW/kg

Impedance Measurement Plot for Body TSL



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C Service suisse d'étalonnage
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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	[signature]

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

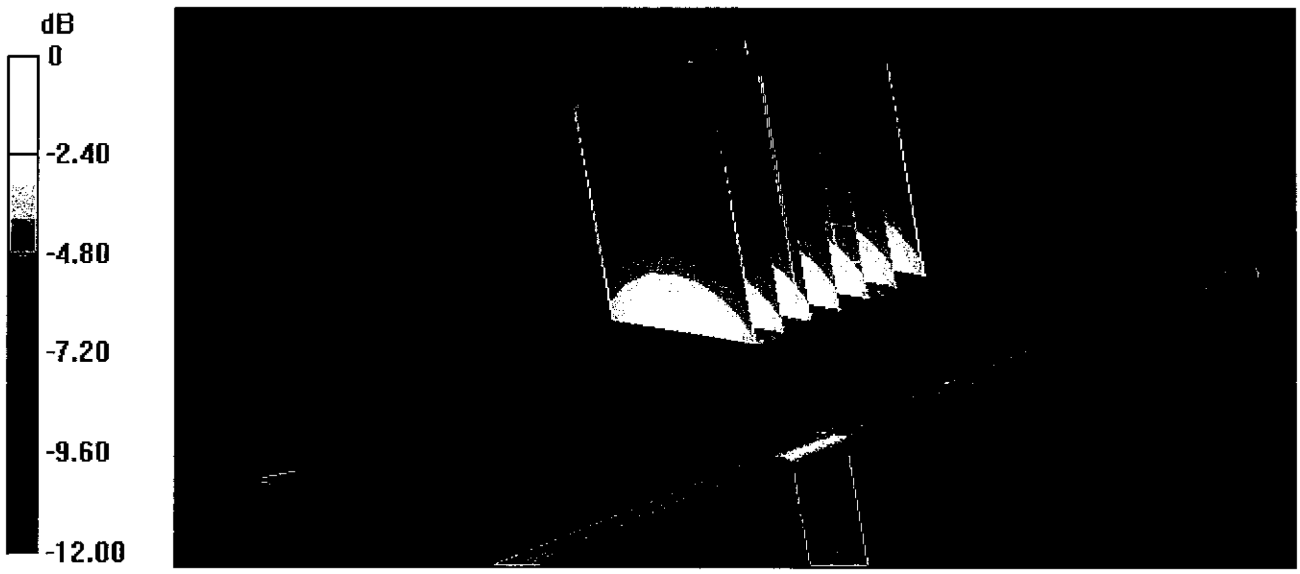
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.89 mho/m; ε_r = 41.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

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)

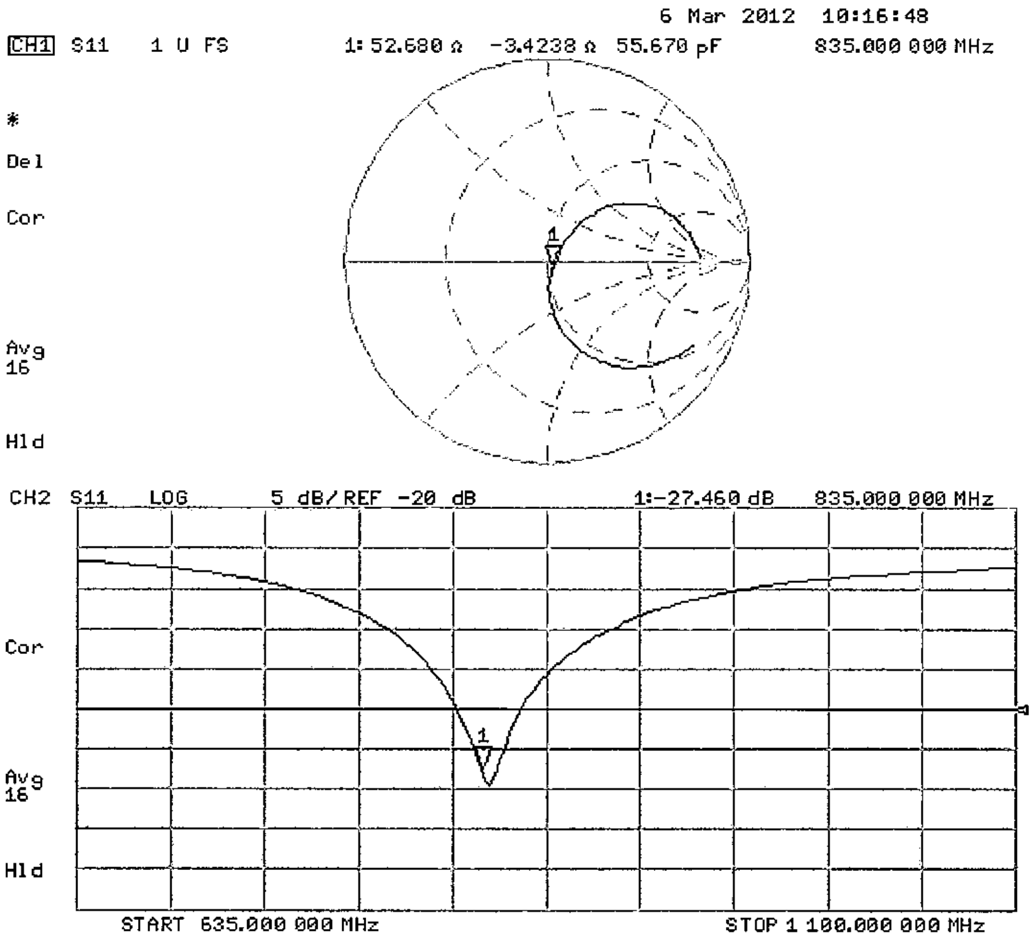
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

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

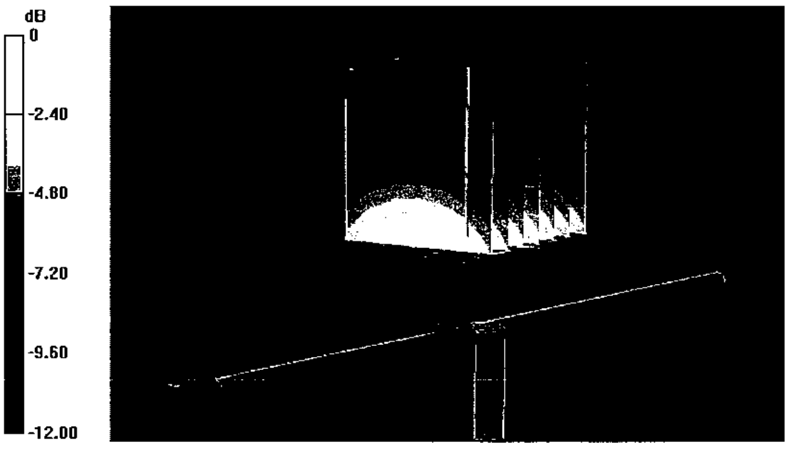
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 1 mho/m; ε_r = 55; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

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)

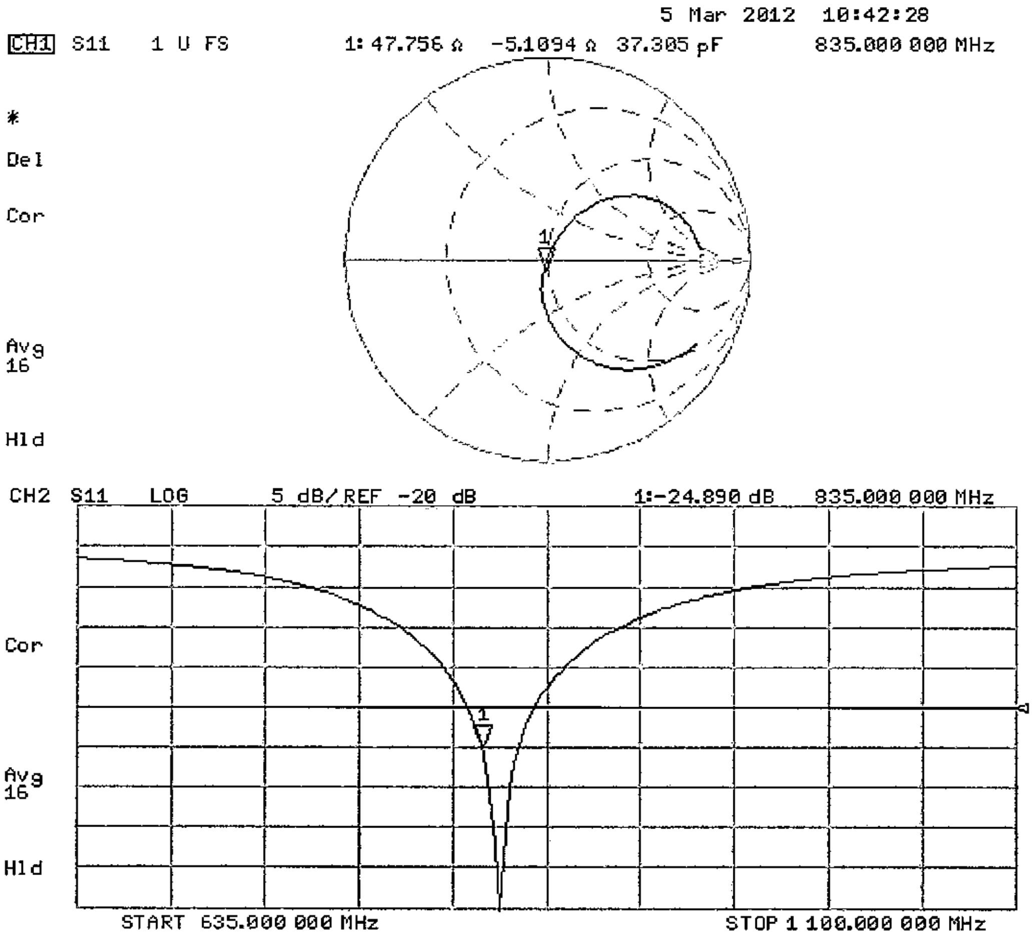
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

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

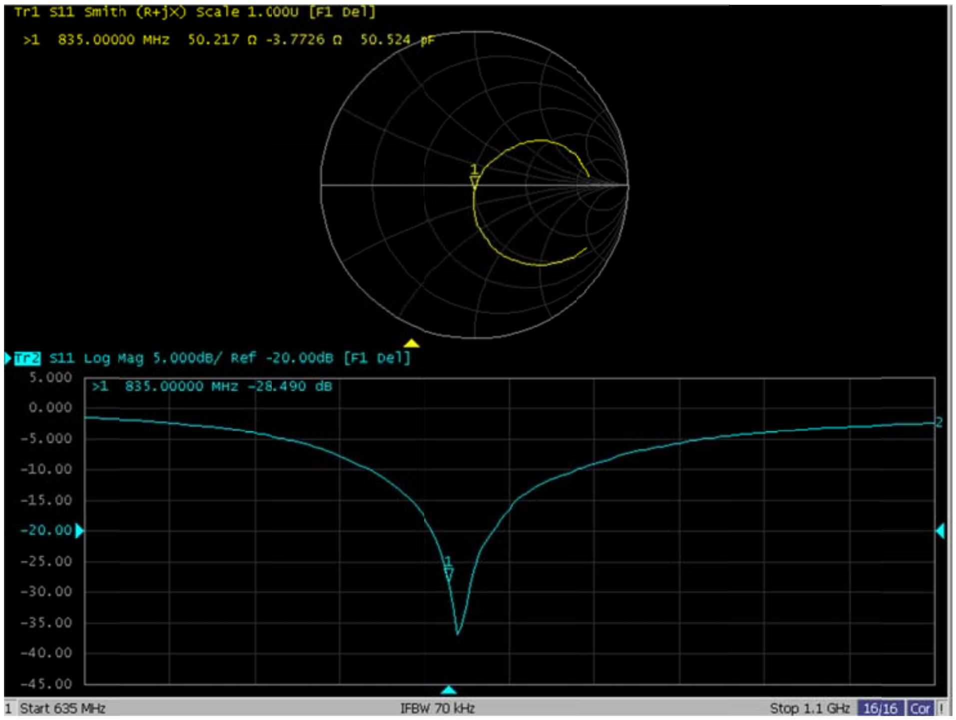
Antenna Parameters with Head TSL

	Calibration certificate	Annual measurement 2013-03-06
Impedance, transformed to feed point	52.7 Ω - 3.4 jΩ	50.2 Ω - 3.8 jΩ
Return loss	- 27.5 dB	- 28.5 dB

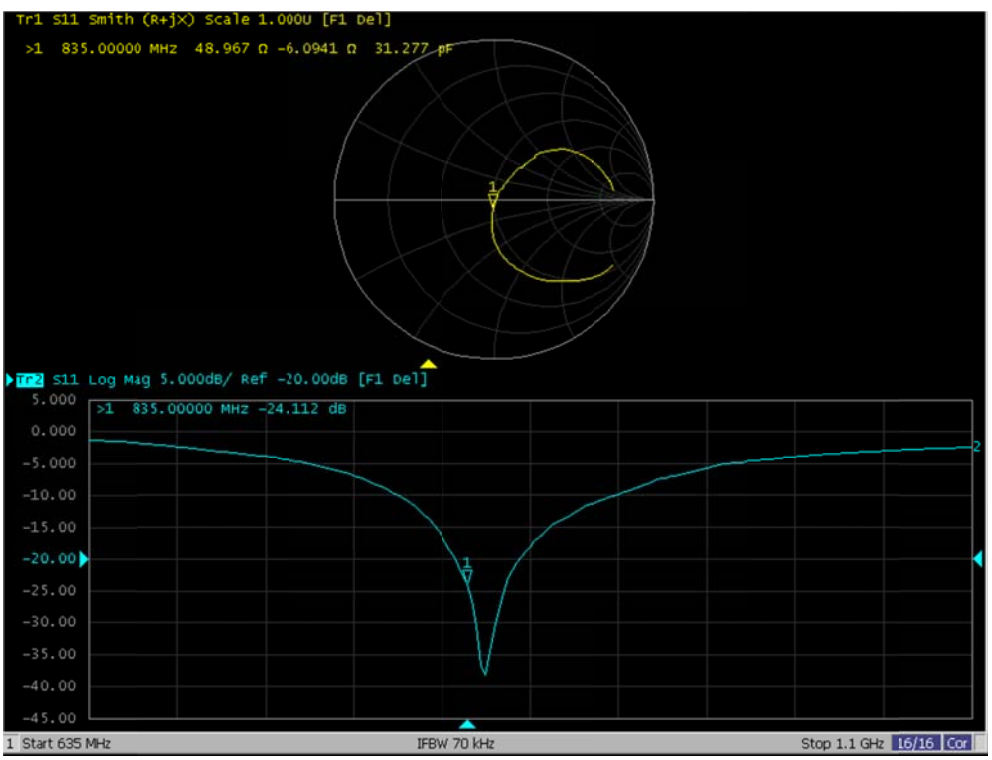
Antenna Parameters with Body TSL

	Calibration certificate	Annual measurement 2013-03-06
Impedance, transformed to feed point	47.8 Ω - 5.1 jΩ	49.0 Ω - 6.1 jΩ
Return loss	- 24.9 dB	- 24.1 dB

Impedance Measurement plot for Head TSL 835



Impedance Measurement plot for Body TSL 835



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S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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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: D1900V2-509_Dec12

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 509
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	December 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	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.3 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13

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-12)	In house check: Oct-13

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

Issued: December 6, 2012

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	47.1 Ω - 5.1 jΩ
Return Loss	- 24.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	43.7 Ω - 5.2 jΩ
Return Loss	- 21.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.192 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 20, 1999

DASY5 Validation Report for Head TSL

Date: 06.12.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 509

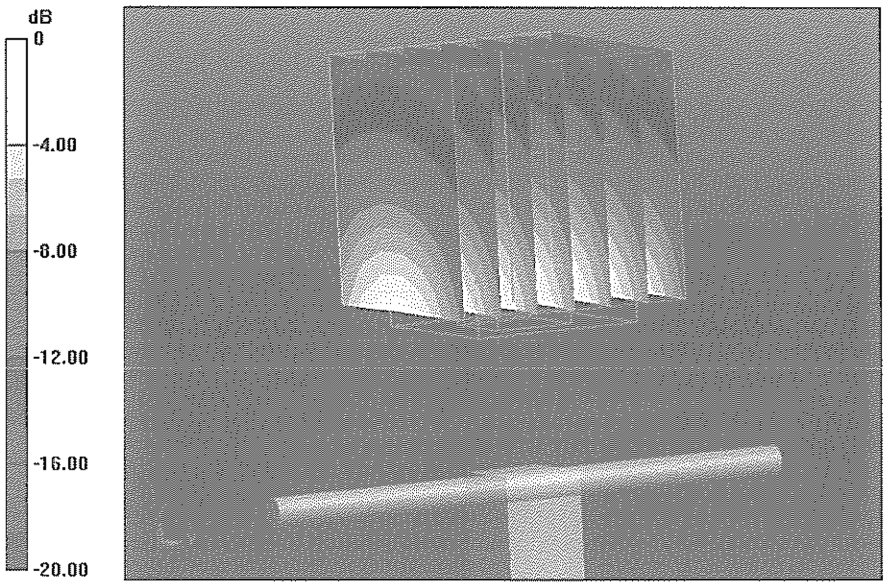
Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma = 1.38$ mho/m; $\varepsilon_r = 39.5$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.01, 5.01, 5.01); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.3(988); SEMCAD X 14.6.7(6848)

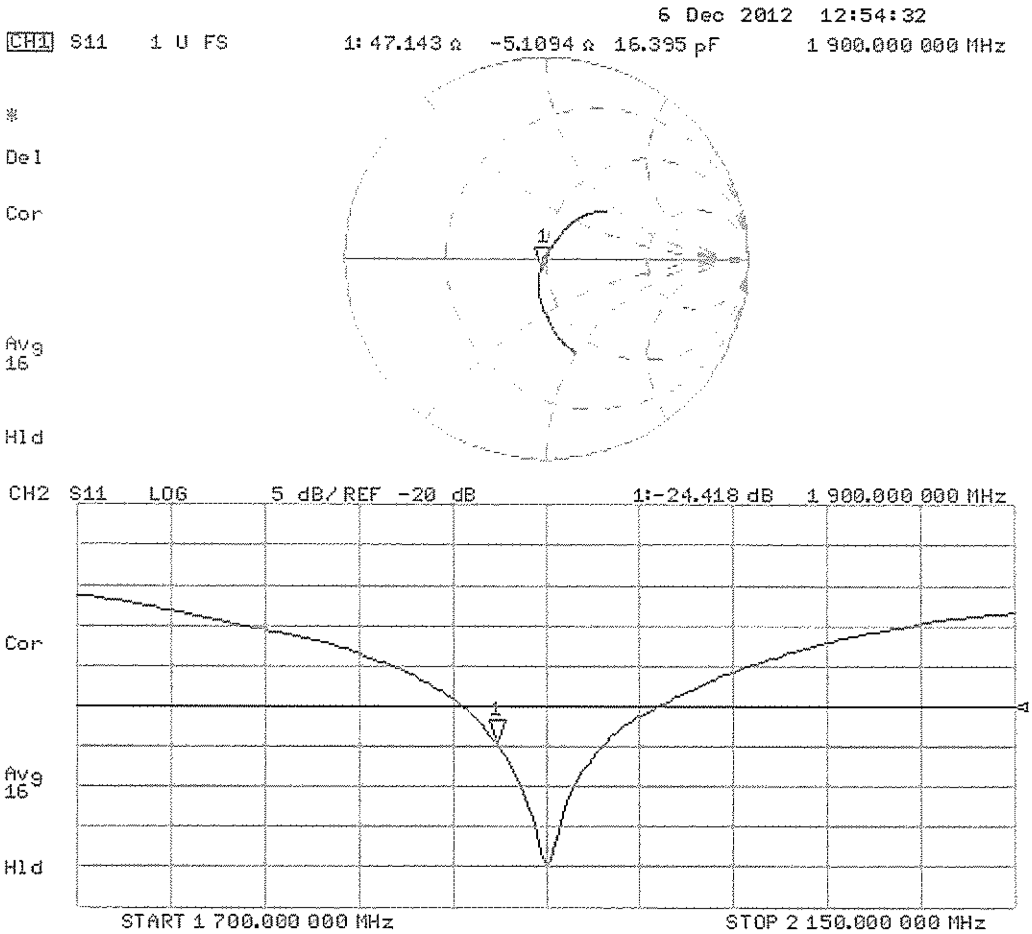
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.248 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 17.2 W/kg
SAR(1 g) = 9.63 W/kg; SAR(10 g) = 5.05 W/kg
Maximum value of SAR (measured) = 11.9 W/kg



0 dB = 11.9 W/kg = 10.76 dBW/kg

Impedance Measurement Plot for Head TSL



Date: 06.12.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 509

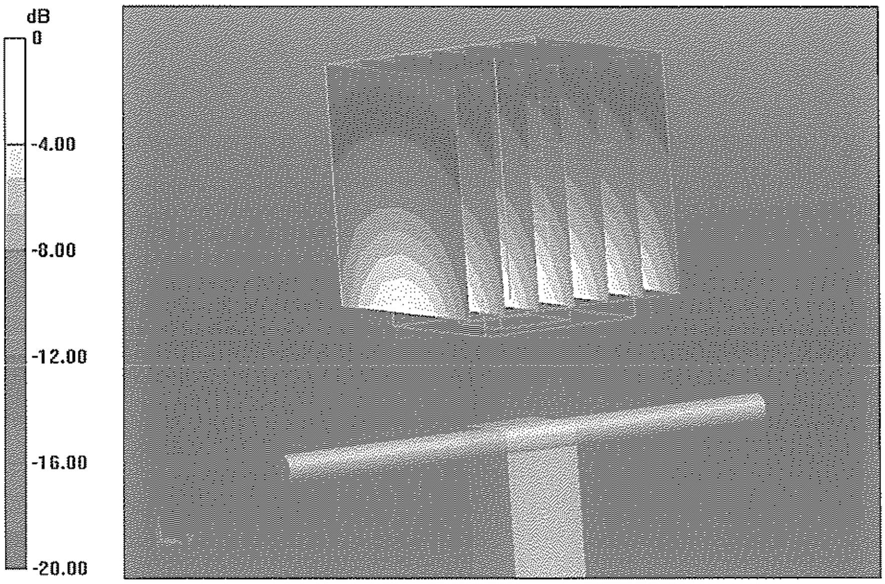
Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.52 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.62, 4.62, 4.62); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.3(988); SEMCAD X 14.6.7(6848)

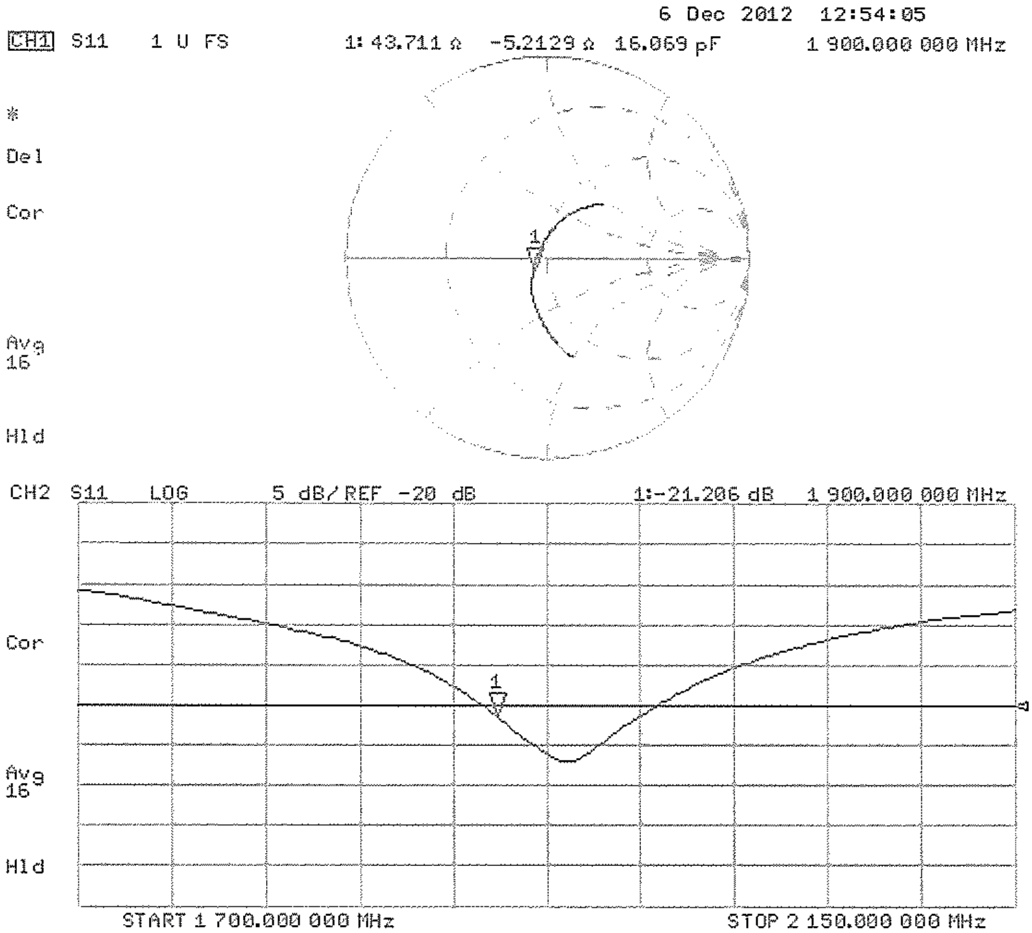
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.176 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 17.4 W/kg
SAR(1 g) = 9.84 W/kg; SAR(10 g) = 5.16 W/kg
Maximum value of SAR (measured) = 12.4 W/kg



0 dB = 12.4 W/kg = 10.93 dBW/kg

Impedance Measurement Plot for Body TSL



Dipole D1900V2 – SN: 509 Antenna Parameters

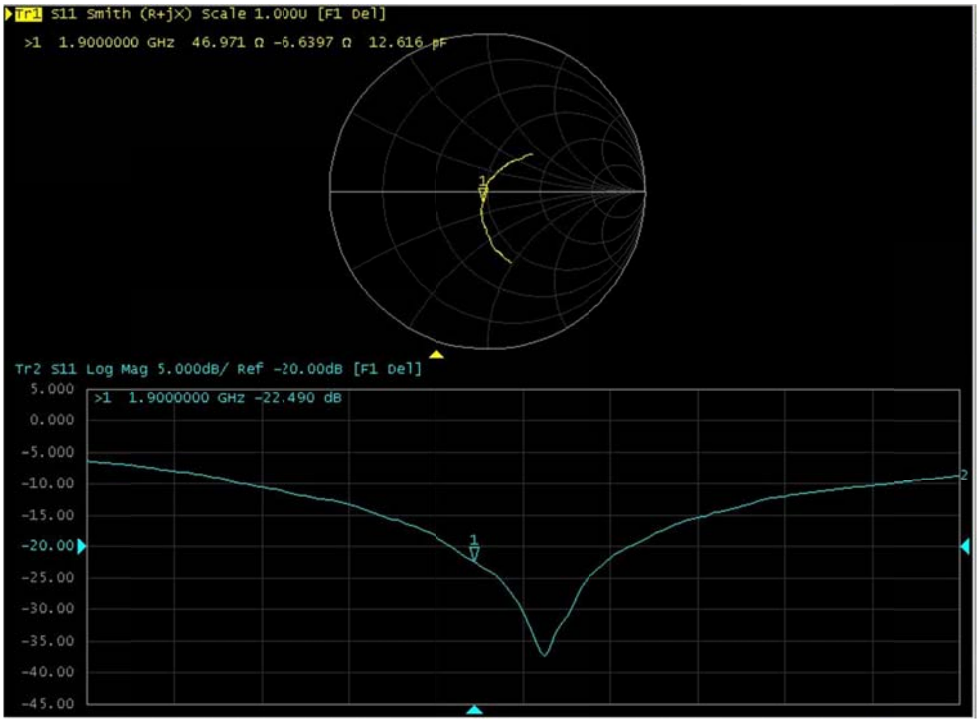
Antenna Parameters with Head TSL

	Calibration certificate	Annual measurement 2013-02-20
Impedance, transformed to feed point	47.1 Ω - 5.1 jΩ	47.0 Ω - 6.6 jΩ
Return loss	- 24.4 dB	- 22.5 dB

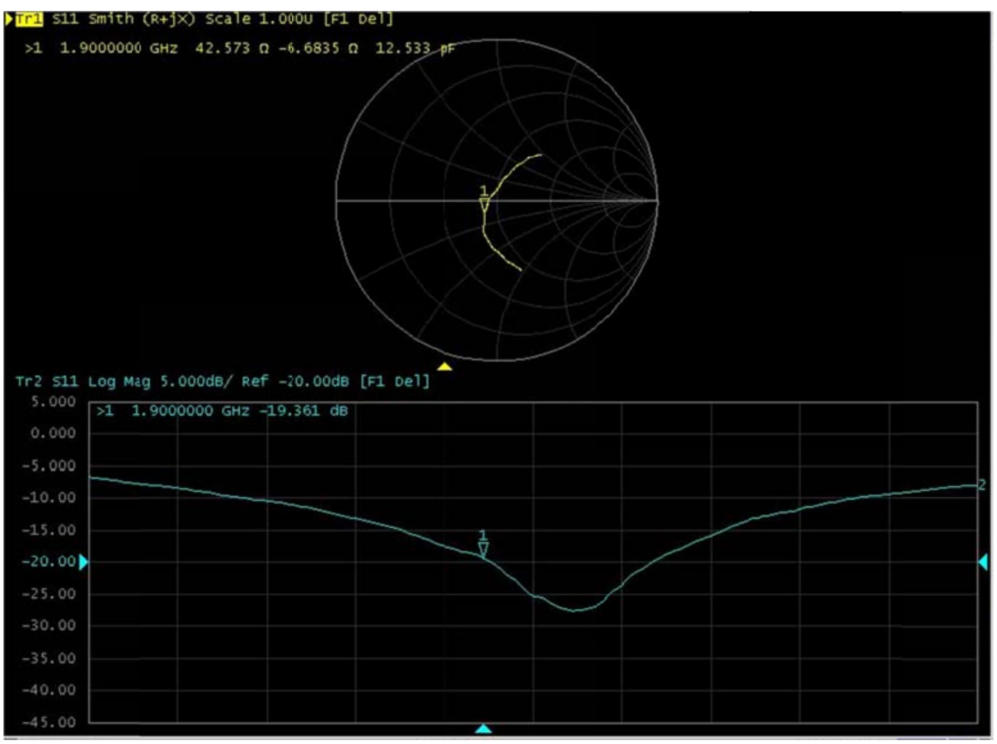
Antenna Parameters with Body TSL

	Calibration certificate	Annual measurement 2013-02-20
Impedance, transformed to feed point	43.7 Ω - 5.2 jΩ	42.6 Ω - 6.7 jΩ
Return loss	- 21.2 dB	- 19.4 dB

Impedance Measurement plot for Head TSL 1900



Impedance Measurement plot for Body TSL 1900



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	30.0	30.0	30.0
GPRS 2-slot	27.0	27.0	27.0
GPRS 3-slot	25.2	25.2	25.2
GPRS 4-slot	24.0	24.0	24.0
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-952; Serial number: 004402/47/428328/4, 004402/47428329/2 used for GSM/GPRS850 SAR Head and Body-worn measurements and GSM/GPRS1900 SAR Head measurements.

GSM 850			
Slot configuration	Low channel	Mid channel	High channel
GSM 1-slot	32.91	32.92	32.91
GPRS 2-slot	29.90	29.89	29.91
GPRS 3-slot	28.08	28.05	28.08
GPRS 4-slot	26.90	26.92	26.93
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	30.40	30.39	30.41
GPRS 2-slot	27.44	27.40	27.41
GPRS 3-slot	25.55	25.62	25.61
GPRS 4-slot	24.35	24.42	24.40
EGRPS 1-slot	-	-	-
EGPRS 2-slot	-	-	-
EGPRS 3-slot	-	-	-
EGPRS 4-slot	-	-	-

Type: RM-952; Serial number: 004402/47/428200/5, 004402/47/428201/3 used for GSM/GPRS1900 SAR Body-worn measurements.

GSM 1900			
Slot configuration	Low channel	Mid channel	High channel
GSM 1-slot	30.40	30.36	30.35
GPRS 2-slot	27.39	27.40	27.35
GPRS 3-slot	25.60	25.61	25.64
GPRS 4-slot	24.40	24.42	24.38
EGRPS 1-slot	-	-	-
EGPRS 2-slot	-	-	-
EGPRS 3-slot	-	-	-
EGPRS 4-slot	-	-	-