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SAR Compliance Test Report

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Tested device:	RM-976		
FCC ID:	PDNRM-976	**IC:**	-
Supplement reports:	SAR_Photo_RM-976_06		

Testing has been carried out in accordance with:

47CFR §2.1093
Radiofrequency Radiation Exposure Evaluation: Portable Devices
FCC published RF exposure KDB procedures
RSS-102, Issue 4
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 - 2013
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.

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1. SUMMARY OF SAR TEST REPORT

1.1 Test Details

Period of test	2014-01-26 to 2014-03-04
SN, HW and SW numbers of tested device	SN: 004402/47/596221/7, HW: 2201, SW: 1052.0000.1351.10049, DUT: 18015 SN: 004402/47/596098/8, HW: 2201, SW: 1052.0000.1351.10049, DUT: 18004 SN: 004402/47/596099/7, HW: 2201, SW: 1052.0000.1351.10049, DUT: 18003 SN: 004402/47/596097/1, HW: 2201, SW: 1052.0000.1351.10049, DUT: 18002 SN: 004402/47/729495/7, HW: 2300, SW: 1058.0000.1406.10062, DUT: 18113 SN: 004402/47/729490/8, HW: 2300, SW: 1058.0000.1406.10062, DUT: 18112
Batteries used in testing	BL-5H, DUT:17900, 17901, 17902, 17903, 17904, 17905, 17906, 17908, 17909
Headsets used in testing	WH-108, DUT:17570
Other accessories used in testing	-
State of sample	Prototype unit
Notes	-

1.2 Maximum Results

The maximum measured SAR values for Head, Body Worn and Wireless Router ("Hotspot") configuration are given in section 1.2.1, 1.2.2 and 1.2.3 respectively. The device conforms to the requirements of the standards when the maximum measured SAR value is less than or equal to the limit.

1.2.1 Head Configuration

Mode	Ch / *f*(MHz)	Conducted power	Position	Measured SAR value (1g avg)	Reported* SAR value (1g avg)	SAR limit (1g avg)	Result	Plot #
4-slot GPRS850	251 / 848.8	28.0 dBm	Left, Cheek	0.867 W/kg	**0.95 W/kg**	1.6 W/kg	PASSED	1
4-slot GPRS1900	512 / 1850.2	23.0 dBm	Right, Cheek	0.316 W/kg	**0.32 W/kg**	1.6 W/kg	PASSED	2
WLAN2450	11 / 2462.0	17.0 dBm	Left, Cheek	1.10 W/kg	**1.39 W/kg**	1.6 W/kg	PASSED	3
4-slot GPRS850 + WLAN2450	-	-	Left, Cheek	1.22 W/kg	**1.52 W/kg**	1.6 W/kg	PASSED	7
4-slot GPRS1900 + WLAN2450	-	-	Left, Cheek	1.12 W/kg	**1.41 W/kg**	1.6 W/kg	PASSED	8

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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 #
4-slot GPRS850	251 / 848.8	28.0 dBm	1.5 cm	1.10 W/kg	**1.21 W/kg**	1.6 W/kg	PASSED	9
4-slot GPRS1900	810 / 1909.8	22.5 dBm	1.5 cm	0.956 W/kg	**1.07 W/kg**	1.6 W/kg	PASSED	10
WLAN2450	11 / 2462.0	17.0 dBm	1.5 cm	0.130 W/kg	**0.16 W/kg**	1.6 W/kg	PASSED	11
4-slot GPRS850 + WLAN2450	-	-	1.5 cm	1.13 W/kg	**1.25 W/kg**	1.6 W/kg	PASSED	-
4-slot GPRS1900 + WLAN2450	-	-	1.5 cm	0.966 W/kg	**1.08 W/kg**	1.6 W/kg	PASSED	-

1.2.3 Wireless Router 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 #
4-slot GPRS850	251 / 848.8	26.1 dBm	10 mm	0.883 W/kg	**0.95 W/kg**	1.6 W/kg	PASSED	12
2-slot GPRS1900	810 / 1908.8	21.1 dBm	10 mm	0.996 W/kg	**1.20 W/kg**	1.6 W/kg	PASSED	13
WLAN2450	10 / 2457.0	17.5 dBm	10 mm	0.297 W/kg	**0.33 W/kg**	1.6 W/kg	PASSED	14
4-slot GPRS850 + WLAN2450	-	-	10 mm	0.926 W/kg	**1.00 W/kg**	1.6 W/kg	PASSED	-
2-slot GPRS1900 + WLAN2450	-	-	10 mm	0.996 W/kg	**1.20 W/kg**	1.6 W/kg	PASSED	13**

* Reported SAR values are scaled to, or measured at, upper limit of power tuning tolerance.

** This is due to fact that in some of the cases combined SAR values are less than the maximum SAR values for the contributing individual band and therefore plot numbers might be the same i.e. the ones providing highest SAR value. Some of the Combined SAR values in the above table are less than the maximum SAR values for the contributing cellular band. This is due to a) minimal overlap of the SAR distributions of the cellular band with WLAN2450 and b) uncertainties associated with the different methods of calculation. In these cases, the maximum SAR values given for the combined Modes in the Summary table in Section 1.2 are those for the individual cellular or WLAN band.

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1.2.4 Summary SAR data

	FCC-defined SAR values for the Grants of Equipment Authorization		
	PCE	DTS	NII
Maximum Head SAR values	0.951 W/kg	1.39 W/kg	-
{Max + Max} Simultaneous Head SAR value	1.40 W/kg		
Maximum Body SAR values	1.21 W/kg	0.164 W/kg	-
{Max + Max} Simultaneous Body SAR value	1.37 W/kg		
Maximum Product Specific (Wireless Router) SAR values	1.20 W/kg	0.333 W/kg	-
{Max + Max} Simultaneous Product Specific SAR value	1.28 W/kg		
Maximum Simultaneous SAR value **Head SAR: 4-slot GPRS850 + WLAN2450**	1.40 W/kg		

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

1.2.5 Maximum Drift

Maximum drift covered by 5% scaling up of the SAR values	Maximum drift during measurements
0.2dB	0.2dB

1.2.6 Measurement Uncertainty

Expanded Uncertainty (k=2) 95%	± 29.8%

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2. DESCRIPTION OF THE DEVICE UNDER TEST

Device category	Portable
Exposure environment	General population / uncontrolled

Modes of Operation	Bands	Modulation Mode	Duty Cycle	Transmitter Frequency Range (MHz)	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	32.0	31.0	29.2	28.0	32.4	31.4	29.6	28.4
	1900			1850 – 1910	28.6	25.6	23.8	22.6	29.0	26.0	24.2	23.0
EGPRS	850	GMSK	1/8 to 4/8	824 – 849	26.5	26.5	26.2	25.0	26.9	26.9	26.6	25.4
	1900			1850 – 1910	25.5	24.6	23.3	22.1	25.9	25.0	23.7	22.5
BT	2450	GFSK	1	2402 - 2480	9.0				10.5			
					Ch 1	Ch 2-10		Ch 11	Ch 1	Ch 2-10		Ch 11
WLAN b-mode*	2450	BPSK, QPSK	1	2412 – 2472	16.5	16.5		16.5	18.0	18.0		18.0
WLAN g-mode*	2450	Up to 64QAM	1	2412 – 2472	12.0	16.5		12.0	13.5	18.0		13.5
WLAN n-mode* 20MHz	2450	Up to 64QAM	1	2412 – 2462 2412 – 2472	12.0	16.5		12.0	13.5	18.0		13.5

*Maximum tuning targets are presented above. See full details in Appendix G.

Outside of USA, the transmitter of the device is capable of operating also in GSM/GPRS/EGPRS900, GSM/GPRS/EGPRS1800, WCDMA/HSUPA900 (Band 8) and WCDMA/HSUPA2100 (Band 1) bands which are not part of this filing.

This device has Voice-over-IP capability for use at the ear. Therefore, SAR for multi slot GPRS mode was evaluated against the head profile of the phantom. Dual Transfer Mode is a feature that utilises the multi-slot GPRS capability in this device; it allows simultaneous transmission of voice and data during the same call, using the same transmitter and antenna.

This is a BT Class 1 device and its power tuning target upper limit is 10.5dBm. WLAN2450 power tuning target upper limit is 18.0dBm. Since WLAN2450 and BT use same frequency and antenna, WLAN2450 power is 7.5dB higher, and they can not transmit simultaneously, the WLAN2450 standalone SAR is conservative estimation of BT SAR. As WLAN2450 SAR result is below limit, also BT SAR can be deemed to comply without further analysis or standalone measurements.Also WLAN2450+cellular bands combined SAR results can be regarded as conservative estimation of BT+cellular combined SARs. As WLAN2450+cellular combined SAR

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result are below limit, also BT+cellular combined SAR can be deemed to comply without further analysis and estimations required in KDB 447498 for simultaneous transmission exclusion.

This device uses a single antenna for transmission of GSM/GPRS/EGPRS850 and GSM/GPRS/EGPRS1900 bands; a separate single antenna is used for WLAN. Simultaneous transmission of any singular cellular and PCS band is possible with WLAN in Head and Body-worn use according to the table below.

Simultaneous transmission capabilities in Head and Body-worn use	
	WLAN2450
GSM/GPRS/EGPRS850	✓
GSM/GPRS/EGPRS1900	✓

This device has Wireless Router "Hotspot" mode capability. Simultaneous transmission of any cellular and PCS band is possible with WLAN2450 in Wireless Router mode.

Simultaneous transmission capabilities in Wireless Router use	
	WLAN2450
GSM/GPRS/EGPRS850	✓
GSM/GPRS/EGPRS1900	✓

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2.1 Power reductions in Wireless Router configurations

The following table details the power reductions active in Wireless Router mode:

Band	Power reduction in WR mode		Target tuning power in WR mode	
GPRS/EGPRS850	1-slot GPRS: 0.0 dB 2-slot GPRS: 2.0 dB 3-slot GPRS: 2.0 dB 4-slot GPRS: 2.0 dB	1-slot EGPRS: 0.0 dB 2-slot EGPRS: 0.0 dB 3-slot EGPRS: 0.0 dB 4-slot EGPRS: 0.0 dB	1-slot GPRS: 32.0 dBm 2-slot GPRS: 29.0 dBm 3-slot GPRS: 27.2 dBm 4-slot GPRS: 26.0 dBm	1-slot EGPRS: 26.5 dBm 2-slot EGPRS: 26.5 dBm 3-slot EGPRS: 26.2 dBm 4-slot EGPRS: 25.0 dBm
GPRS/EGPRS1900	1-slot GPRS: 5.1 dB 2-slot GPRS: 4.1 dB 3-slot GPRS: 4.3 dB 4-slot GPRS: 5.1 dB	1-slot EGPRS: 2.0 dB 2-slot EGPRS: 3.1 dB 3-slot EGPRS: 3.8 dB 4-slot EGPRS: 4.6 dB	1-slot GPRS: 23.5 dBm 2-slot GPRS: 21.5 dBm 3-slot GPRS: 19.5 dBm 4-slot GPRS: 17.5 dBm	1-slot EGPRS: 23.5 dBm 2-slot EGPRS: 21.5 dBm 3-slot EGPRS: 19.5 dBm 4-slot EGPRS: 17.5 dBm
WLAN2450 b-mode (DSSS 1 Mbps)	0 dB		16.5 dBm	

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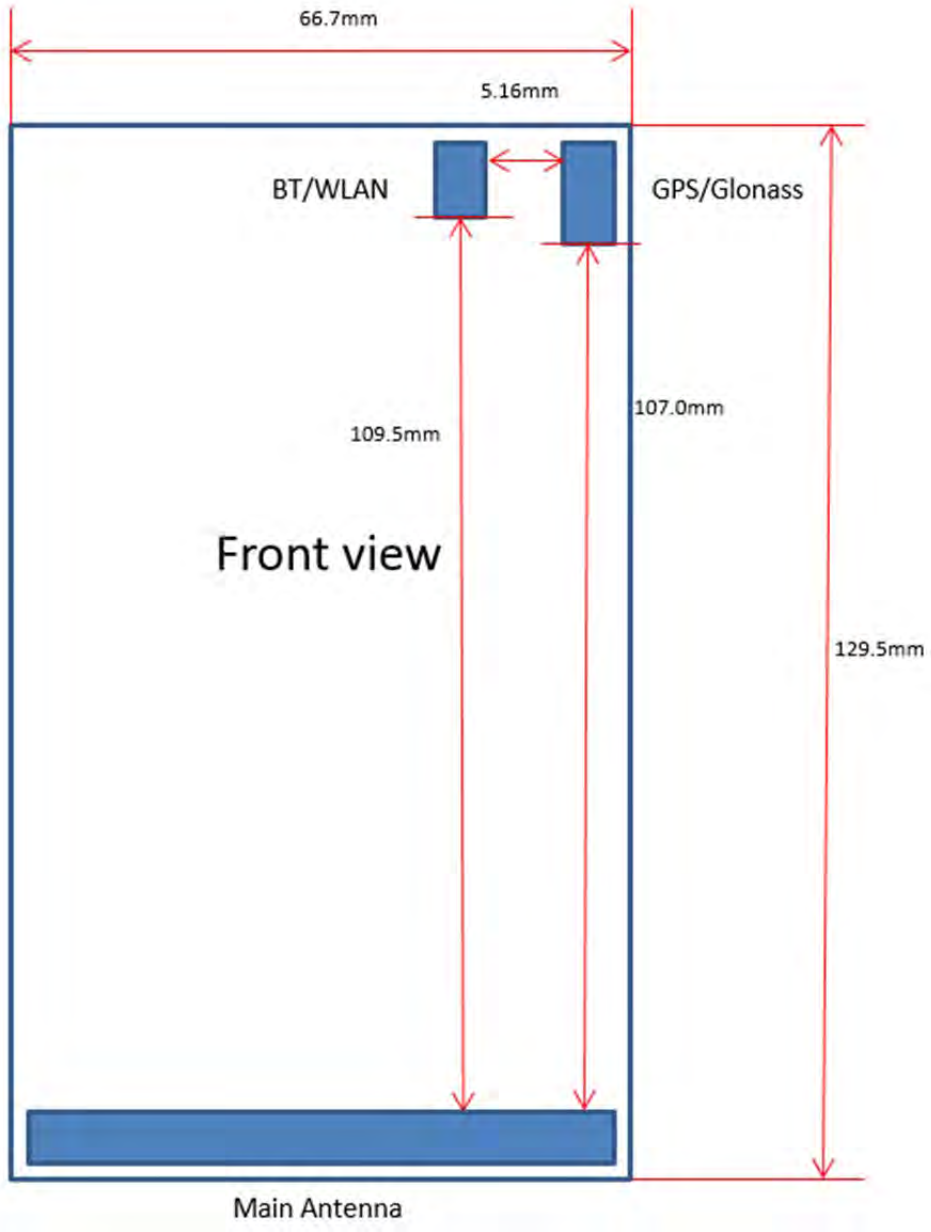
2.2 Description of the Antenna

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



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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 except for testing WLAN2450 where control software was used. Communication between the device and the call tester was established by air link.

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

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

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 the appendixes F-G of this report.

The number of Tx slots in all GSM/GPRS mode tests was based on tuning target/conducted power data, see Appendix F. The number of slots with highest, or equal highest, time-averaged power was tested.

The transmission mode of the device in WLAN b-mode tests was BPSK 1Mbps. Additionally WLAN b-mode, QPSK 5.5 Mbps was used for check measurements. All WLAN testing has been carried out in accordance with FCC KDB 248227: SAR Measurement Procedures for 802.11 a/b/g Transmitters.

Here is a summary list of the KDB documents used in the reported testing:

KDB 248227: SAR Measurement Procedures for 802.11 a/b/g Transmitters
KDB 648474 D04 Handset SAR v01r01
KDB 941225 D06 v01 Hot Spot SAR
KDB 447498 D01 General RF Exposure Guidance v05r01
KDB 690783 D01 SAR Listings on Grants
KDB 865664 D01 SAR measurements 100MHz to 6GHz v01
KDB 865664 D02 SAR Reporting v01r01

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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
DAE4	793	2013-06	2014-06
DAE4	538	2013-11	2014-11
DAE4	1302	2013-11	2014-11
E-field Probe ES3DV3	3194	2013-11	2014-11
E-field Probe ES3DV3	3131	2013-06	2014-06
E-field Probe EX3DV4	3960	2013-12	2014-12
Dipole Validation Kit, D835V2	480	2012-12	2014-12
Dipole Validation Kit, D1900V2	5d013	2012-12	2014-12
Dipole Validation Kit, D2450V2	749	2012-12	2014-12
DASY5 software	Version 52.8	-	-

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Additional test equipment used in testing:

Test Equipment	Model	Serial Number	Calibration date	Calibration expiry
Signal Generator	E4438C	MY42080610	2013-08	2014-08
Signal Generator	SMB100A	105735	2013-08	2014-08
Signal Generator	E4436B	US39260114	2013-08	2014-08
Amplifier	5S1G4M3	302338	-	-
Amplifier	5S4G11	312661	-	-
Amplifier	5S1G4	25583	-	-
Power Meter	NRVS	838624/032	2013-08	2014-08
Power Meter	NRP	100714	2013-08	2014-08
Power Meter	NRVZ	849305/029	2013-08	2014-08
Power Sensor	NRV-Z32	100067	2013-08	2014-08
Power Sensor	NRP-Z92	100085	2013-08	2014-08
Power Sensor	NRV-Z32	825600/002	2013-08	2014-08
Call Tester	CMU 200	103293	-	-
Call Tester	CMU 200	101111	-	-
Call Tester	CMU 200	837727/008	-	-
Call Tester	MT8820C	6200883095	-	-
Network Analyzer	ENA E5071C	MY46213166	2013-08	2014-08
Dielectric Probe Kit	DAK-3.5	1042	-	-

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4.1.1 Isotropic E-field Probe Type ES3DV3

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., butyl diglycol)
Calibration	Calibration certificate in Appendix D
Frequency	10 MHz to 4 GHz (dosimetry); Linearity: ± 0.2 dB (30 MHz to 4 GHz)
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.3 dB in HSL (rotation normal to probe axis)
Dynamic Range	5 µW/g to > 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm Tip length: 20 mm Body diameter: 12 mm Tip diameter: 3.9 mm Distance from probe tip to dipole centers: 2.0 mm
Application	General dosimetry up to 4 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

4.1.2 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

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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.

The phantom used for all Body SAR tests i.e. for both system checks and device testing, was a "Triple Flat Phantom", also manufactured by SPEAG; this phantom conform to the requirements of FCC published RF exposure KDB procedures.

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 and FCC published RF Exposure KDB Procedures. 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 recipes were used for Head and Body tissue simulants:

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

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2450MHz band

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

4.4 System validation and System checking

4.4.1 System validation status

Probe Calibration Point f / MHz	Test System	DASY SW	Dipole Type / SN	Probe Type / SN	Calibrated signal type(s)	DAE unit Type / SN	Validation done	
							Head tissue simulant	Body tissue simulant
835	TCC Salo / SAR-2	V52.8	D835V2 / 480	ES3DV4 / 3194	CW	DAE4 / 538	2013-12	2013-12
1900	TCC Salo / SAR-1	V52.8	D1900V2 / 5d013	ES3DV3 / 3131	CW	DAE4 / 793	2013-07	2013-07
2450	TCC Salo / SAR-4	V52.8	D2450V2 / 749	EX3DV4 / 3960	CW	DAE4 / 1302	2014 -01	2014 -01

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.

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System checking, head tissue simulant

f [MHz]	Description	SAR 1g [W/kg]	Estimated SAR 1g [W/kg]	Estimated SAR 1g Deviation	Scaled 1W SAR 1g [W/kg]	Dielectric Parameters*		SAR 1g Deviation from target	Dielectric Parameters Deviation from target		Temp	Plot #
				dSAR [%]		ε_r	σ [S/m]	dSAR [%]	$d\varepsilon_r$ [%]	dσ [%]	[°C]	
	Tolerances			±3%				±10 %	±5 %	±5 %		
835	Reference result SN:480	-	-	-	9.40	41.5	0.90	TCC Salo/SAR-2 ES3DV3 SN:3194 Head 835MHz				
	2014-01-31	2.30	2.34	1.74	9.20	40.2	0.89	-2.13	-3.13	-1.11	22.0	-
	2014-02-04	2.28	2.32	1.75	9.12	41.1	0.89	-2.98	-0.96	-1.11	21.5	1
	2014-03-03	2.30	2.35	2.17	9.20	40.6	0.89	-2.13	-2.17	-1.11	22.0	-
1900	Reference result SN:5d013	-	-	-	40.60	40.0	1.40	TCC Salo/SAR-1 ES3DV3 SN:3131 Head 1900MHz				
	2014-01-29	9.30	9.35	0.54	37.20	39.3	1.40	-8.37	-1.75	0.00	21.5	2
	2014-03-04	9.49	9.58	0.95	37.96	39.0	1.37	-6.50	-2.50	-2.14	21.5	-
2450	Reference result SN:749	-	-	-	53.90	39.2	1.80	TCC Salo/SAR-4 ES3DV3 SN:3960 Head 2450MHz				
	2014-01-26	13.60	13.60	0.00	54.40	38.6	1.79	0.93	-1.53	-0.56	21.0	-
	2014-02-04	13.70	13.80	0.73	54.80	38.5	1.80	1.67	-1.79	0.00	21.4	3

* Dielectric parameter reference data taken from IEEE1528/IEC62209

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System checking, body tissue simulant

f [MHz]	Description	SAR 1g [W/kg]	Estimated SAR 1g [W/kg]	Estimated SAR 1g Deviation	Scaled 1W SAR 1g [W/kg]	Dielectric Parameters*		SAR 1g Deviation from target	Dielectric Parameters Deviation from target		Temp	Plot #
				dSAR [%]		ε_r	σ [S/m]	dSAR [%]	$d\varepsilon_r$ [%]	dσ [%]	[°C]	
	Tolerances			±3%				±10 %	±5 %	±5 %		
835	Reference result SN:480	-	-	-	9.51	55.2	0.97	TCC Salo/SAR-2 ES3DV3 SN:3194 Body 835MHz				
	2014-01-28	2.35	2.37	0.85	9.40	54.3	0.98	-1.16	-1.63	1.03	21.8	-
	2014-02-03	2.31	2.36	2.16	9.24	54.0	0.97	-2.84	-2.17	0.00	21.7	4
	2014-03-04	2.34	2.37	1.28	9.36	54.2	0.97	-1.58	-1.81	0.00	21.4	-
1900	Reference result SN:5d013	-	-	-	41.00	53.3	1.52	TCC Salo/SAR-1 ES3DV3 SN:3131 Body 1900MHz				
	2014-01-29	9.77	9.64	-1.33	39.08	51.9	1.52	-4.68	-2.63	0.00	21.3	-
	2014-01-30	9.42	9.37	-0.53	37.68	51.9	1.52	-8.10	-2.63	0.00	21.2	5
	2014-03-03	9.73	9.75	0.21	38.92	51.3	1.50	-5.07	-3.75	-1.32	21.2	-
2450	Reference result SN:749	-	-	-	51.50	52.7	1.95	TCC Salo/SAR-4 ES3DV3 SN:3960 Body 2450MHz				
	2014-01-29	12.50	12.50	0.00	50.00	51.5	1.94	-2.91	-2.28	-0.51	21.4	6
	2014-01-30	12.50	12.50	0.00	50.00	51.3	1.93	-2.91	-2.66	-1.03	21.3	-

* Dielectric parameter reference data taken from FCC Published RF Exposure KDB Procedures

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

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4.5 Tissue Simulants used in the Measurements

Head tissue simulant measurements

f [MHz]	Description	Dielectric Parameters		Dielectric Parameters Deviation from recommended value		Temp [°C]
		εr	σ [S/m]	dεr [%]	dσ [%]	
	Tolerances			±5 %	±5 %	
836	Recommended value	41.5	0.90			
	2014-01-31	40.2	0.89	-3.13	-1.11	22.0
	2014-02-04	41.1	0.89	-0.96	-1.11	21.5
	2014-03-03	40.6	0.89	-2.17	-1.11	22.0
1880	Recommended value	40.0	1.40			
	2014-01-29	39.4	1.38	-1.50	-1.43	21.5
	2014-03-04	39.0	1.36	-2.50	-2.86	21.5
2437	Recommended value	39.2	1.79			
	2014-01-26	38.7	1.78	-1.28	-0.56	21.0
	2014-02-04	38.5	1.79	-1.79	0.00	21.4

Body tissue simulant measurements

f [MHz]	Description	Dielectric Parameters		Dielectric Parameters Deviation from Recommended value		Temp [°C]
		εr	σ [S/m]	dεr [%]	dσ [%]	
	Tolerances			±5 %	±5 %	
836	Recommended value	55.2	0.97			
	2014-01-28	54.3	0.98	-1.63	1.03	21.8
	2014-02-03	54.0	0.98	-2.17	1.03	21.7
	2014-03-04	54.2	0.97	-1.81	0.00	21.4
1880	Recommended value	53.3	1.52			
	2014-01-29	52.0	1.50	-2.44	-1.32	21.3
	2014-01-30	51.9	1.50	-2.63	-1.32	21.2
	2014-03-03	51.3	1.48	-3.75	-2.63	21.2
2437	Recommended value	52.7	1.94			
	2014-01-29	51.5	1.92	-2.28	-1.03	21.4
	2014-01-30	51.3	1.92	-2.66	-1.03	21.3

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

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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 "IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques".

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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.

5.2.3 Wireless Router Configuration

The device was placed in the SPEAG holder and, in sequence, the back, display and each of the 4 edges was positioned 10.0mm away from the flat phantom. The spacer was removed before the start of the measurements.

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. Fast SAR is measured according to the KDB 447498 D01 General RF Exposure Guidance v05r01.

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.

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6. MEASUREMENT UNCERTAINTY

Table 6.1 – Measurement uncertainty evaluation for 1g Full SAR in 0.3-6GHz range

Uncertainty Component	Section in IEEE 1528	Tol. (%)	Prob Dist	Div	c_i	$c_i . u_i$ (%)	v_i
Measurement System							
Probe Calibration	E2.1	±6.6	N	1	1	±6.6	∞
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	±2.0	R	√3	1	±1.2	∞
Linearity	E2.4	±4.7	R	√3	1	±2.7	∞
System Detection Limits	E2.5	±1.0	R	√3	1	±0.6	∞
Modulation response	E2.5	±2.4	R	√3	1	±1.4	
Readout Electronics	E2.6	±0.3	N	1	1	±0.3	∞
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	±0.8	R	√3	1	±0.5	∞
Probe Positioning with respect to Phantom Shell	E6.3	±6.7	R	√3	1	±3.9	∞
Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	E5	±4.0	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	±3.6	N	1	1	±3.6	5
Output Power Variation - SAR drift measurement	E2.9	±5.0	R	√3	1	±2.9	∞
Phantom and Tissue Parameters							
Phantom Uncertainty (shape and thickness tolerances)	E3.1	±6.6	R	√3	1	±3.8	∞
SAR correction	E3.2	±1.9	R	√3	1	±1.1	∞
Conductivity Target - tolerance	E3.4	±5.0	R	√3	0.6	±1.8	∞
Conductivity - measurement uncertainty	E3.3	±5.5	N	1	0.6	±3.5	5
Permittivity Target - tolerance	E3.4	±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			**±14.0**	198
Coverage Factor for 95%			**k=2**				
Expanded Uncertainty						**±28.2**	

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Table 6.2 – Measurement uncertainty evaluation for 1g Fast SAR in 0.3-6GHz range

Relative DASY5 Uncertainty Budget for Fast SAR Tests According to IEEE 1528/2011 and IEC 62209-1/2011 (0.3-6 GHz range)						
Uncertainty Component	**Tol. (%)**	**Prob Dist.**	**Div.**	c_i	$c_i.u_i$ (%)	v_i
Measurement System						
Probe Calibration	±6.6	N	1	0		
Axial Isotropy	±4.7	R	√3	$(1-c_p)^{1/2}$	±1.9	∞
Hemispherical Isotropy	±9.6	R	√3	$(c_p)^{1/2}$	±3.9	∞
Boundary Effect	±2.0	R	√3	1	±1.2	∞
Linearity	±4.7	R	√3	1	±2.7	∞
System Detection Limits	±1.0	R	√3	1	±0.6	∞
Modulation Response	±2.4	R	√3	1	±1.4	∞
Readout Electronics	±0.3	N	1	0		
Response Time	±0.8	R	√3	0		
Integration Time	±2.6	R	√3	1	±1.5	∞
RF Ambient Conditions - Noise	±3.0	R	√3	1	±1.7	∞
RF Ambient Conditions - Reflections	±3.0	R	√3	0		
Probe Positioner Mechanical Tolerance	±0.8	R	√3	1	±0.5	∞
Probe Positioning with respect to Phantom Shell	±6.7	R	√3	1	±3.9	∞
Spatial x-y Resolution	±10.0	R	√3	1	±5.8	∞
Fast SAR z Approximation	±14.0	R	√3	1	±8.1	∞
Test sample Related						
Test Sample Positioning	±6.0	N	1	1	±6.0	12
Device Holder Uncertainty	±3.6	N	1	1	±3.6	5
Output Power Variation - SAR drift measurement	±5.0	R	√3	1	±2.9	∞
Power Scaling	±0	R	√3	0		
Phantom and Setup						
Phantom Uncertainty (shape and thickness tolerances)	±6.6	R	√3	1	±3.8	∞
SAR correction	±1.9	R	√3	0		
Conductivity Target - tolerance	±1.9	R	√3	0		
Conductivity - measurement uncertainty	±5.0	R	√3	0		
Permittivity Target - tolerance	±5.5	N	1	0		
Permittivity - measurement uncertainty	±5.0	R	√3	0		
Combined Standard Uncertainty		RSS			**±14.9**	748
Coverage Factor for 95%		**k=2**				
Expanded Uncertainty					**±29.8**	

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7. RESULTS

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

850MHz Band Head SAR results HW2201

Mode	Device orientation	SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Max Deviation (Estimated SAR - Full 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]		32.4			Scaling factor*				
	Conducted Slot Average Power [dBm]		31.9	31.9	32.0	0.5	0.5	0.4	dB	
	Time-averaged power [dBm]		22.9	22.9	23.0	1.12	1.12	1.10	Lin	
			No testing required for this slot configuration.							
2-slot GPRS	Tuning Target + Tolerance [dBm]		31.4			Scaling factor*				
	Conducted Slot Average Power [dBm]		31.1	30.9	31.0	0.3	0.5	0.4	dB	
	Time-averaged power [dBm]		25.1	24.9	25.0	1.07	1.12	1.10	Lin	
			No testing required for this slot configuration.							
3-slot GPRS	Tuning Target + Tolerance [dBm]		29.6			Scaling factor*				
	Conducted Slot Average Power [dBm]		29.3	29.2	29.2	0.3	0.4	0.4	dB	
	Time-averaged power [dBm]		25.0	24.9	24.9	1.07	1.10	1.10	Lin	
			No testing required for this slot configuration.							
4-slot GPRS	Tuning Target + Tolerance [dBm]		28.4			Scaling factor*				
	Conducted Slot Average Power [dBm]		28.2	28.1	28.0	0.2	0.3	0.4	dB	
	Time-averaged power [dBm]		25.2	25.1	25.0	1.05	1.07	1.10	Lin	
	Left Cheek	Estimated SAR	0.662	0.766	0.792	0.693	0.821	0.868	0.04	-
		Full SAR	-	-	0.829	-	-	0.909		
	Left Tilt	Estimated SAR	-	0.473	-	-	0.507	-	-	-
		Full SAR	-	-	-	-	-	-		
	Right Cheek	Estimated SAR	-	0.720	-	-	0.771	-	-	-
		Full SAR	-	-	-	-	-	-		
	Right Tilt	Estimated SAR	-	0.497	-	-	0.533	-	-	-
		Full SAR	-	-	-	-	-	-		
	Repeated SAR Left Cheek	Estimated SAR	-	-	-	-	-	-	-	1
		Full SAR	-	-	0.867	-	-	**0.951**		

(850MHz Head table continues)

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(850MHz Head table continues)

Mode	Device orientation	SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Max Deviation (Estimated SAR - Full 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 8PSK EGPRS	Tuning Target + Tolerance [dBm]		26.9			Scaling factor*				
	Conducted Slot Average Power [dBm]		26.7	26.5	26.5	0.2	0.4	0.4	dB	
	Time-averaged power [dBm]		17.7	17.5	17.5	1.05	1.10	1.10	Lin	
			No testing required for this slot configuration.							
2-slot 8PSK EGPRS	Tuning Target + Tolerance [dBm]		26.9			Scaling factor*				
	Conducted Slot Average Power [dBm]		26.7	26.5	26.4	0.2	0.4	0.5	dB	
	Time-averaged power [dBm]		20.7	20.5	20.4	1.05	1.10	1.12	Lin	
			No testing required for this slot configuration.							
3-slot 8PSK EGPRS	Tuning Target + Tolerance [dBm]		26.6			Scaling factor*				
	Conducted Slot Average Power [dBm]		26.4	26.2	26.1	0.2	0.4	0.5	dB	
	Time-averaged power [dBm]		22.1	21.9	21.8	1.05	1.10	1.12	Lin	
	Left Cheek	Estimated SAR	-	-	0.382	-	-	0.429	-	-
		Full SAR	-	-	-	-	-	-		
4-slot 8PSK EGPRS	Tuning Target + Tolerance [dBm]		25.4			Scaling factor*				
	Conducted Slot Average Power [dBm]		25.1	24.9	24.8	0.3	0.5	0.6	dB	
	Time-averaged power [dBm]		22.1	21.9	21.8	1.07	1.12	1.15	Lin	
			No testing required for this slot configuration.							

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Mode	Device orientation	SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Max Deviation (Estimated SAR - Full 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]		32.4			Scaling factor*				
	Conducted Slot Average Power [dBm]		32.3	32.4	32.2	0.1	0.0	0.2	dB	
	Time-averaged power [dBm]		23.3	23.4	23.2	1.02	1.00	1.05	Lin	
			No testing required for this slot configuration.							
2-slot GPRS	Tuning Target + Tolerance [dBm]		31.4			Scaling factor*				
	Conducted Slot Average Power [dBm]		31.2	30.9	31.1	0.2	0.5	0.3	dB	
	Time-averaged power [dBm]		25.2	24.9	25.1	1.05	1.12	1.07	Lin	
	Left Cheek	Estimated SAR	0.479	0.550	0.672	0.502	0.617	0.720	0.02	-
		Full SAR	-	-	0.694	-	-	0.744		
3-slot GPRS	Tuning Target + Tolerance [dBm]		29.6			Scaling factor*				
	Conducted Slot Average Power [dBm]		29.2	29.0	29.0	0.4	0.6	0.6	dB	
	Time-averaged power [dBm]		24.9	24.7	24.7	1.10	1.15	1.15	Lin	
			No testing required for this slot configuration.							
4-slot GPRS	Tuning Target + Tolerance [dBm]		28.4			Scaling factor*				
	Conducted Slot Average Power [dBm]		27.9	27.5	27.7	0.5	0.9	0.7	dB	
	Time-averaged power [dBm]		24.9	24.5	24.7	1.12	1.23	1.17	Lin	
			No testing required for this slot configuration.							

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1900MHz Band Head SAR results HW2201

Mode	Device orientation	SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Max Deviation (Estimated SAR - Full 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]		29.0			Scaling factor*				
	Conducted Slot Average Power [dBm]		28.8	28.7	28.5	0.2	0.3	0.5	dB	
	Time-averaged power [dBm]		19.8	19.7	19.5	1.05	1.07	1.12	Lin	
			No testing required for this slot configuration.							
2-slot GPRS	Tuning Target + Tolerance [dBm]		26.0			Scaling factor*				
	Conducted Slot Average Power [dBm]		25.9	25.7	25.4	0.1	0.3	0.6	dB	
	Time-averaged power [dBm]		19.9	19.7	19.4	1.02	1.07	1.15	Lin	
			No testing required for this slot configuration.							
3-slot GPRS	Tuning Target + Tolerance [dBm]		24.2			Scaling factor*				
	Conducted Slot Average Power [dBm]		23.9	23.7	23.4	0.3	0.5	0.8	dB	
	Time-averaged power [dBm]		19.6	19.4	19.1	1.07	1.12	1.20	Lin	
			No testing required for this slot configuration.							
4-slot GPRS	Tuning Target + Tolerance [dBm]		23.0			Scaling factor*				
	Conducted Slot Average Power [dBm]		22.9	22.7	22.4	0.1	0.3	0.6	dB	
	Time-averaged power [dBm]		19.9	19.7	19.4	1.02	1.07	1.15	Lin	
	Left Cheek	Estimated SAR	-	0.228	-	-	0.244	-	-	-
		Full SAR	-	-	-	-	-	-		
	Left Tilt	Estimated SAR	-	0.181	-	-	0.194	-	-	-
		Full SAR	-	-	-	-	-	-		
	Right Cheek	Estimated SAR	0.195	0.261	0.121	0.200	0.280	0.139	0.00	-
		Full SAR	-	0.265	-	-	0.284	-		
	Right Tilt	Estimated SAR	-	0.148	-	-	0.159	-	-	-
		Full SAR	-	-	-	-	-	-		

(1900MHz Head table continues)

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(1900MHz Head table continues)

Mode	Device orientation	SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Max Deviation (Estimated SAR - Full 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 8PSK EGPRS	Tuning Target + Tolerance [dBm]		25.9			Scaling factor*				
	Conducted Slot Average Power [dBm]		25.7	25.4	25.1	0.2	0.5	0.8	dB	
	Time-averaged power [dBm]		16.7	16.4	16.1	1.05	1.12	1.20	Lin	
			No testing required for this slot configuration.							
2-slot 8PSK EGPRS	Tuning Target + Tolerance [dBm]		25.0			Scaling factor*				
	Conducted Slot Average Power [dBm]		24.9	24.6	24.4	0.1	0.4	0.6	dB	
	Time-averaged power [dBm]		18.9	18.6	18.4	1.02	1.10	1.15	Lin	
			No testing required for this slot configuration.							
3-slot 8PSK EGPRS	Tuning Target + Tolerance [dBm]		23.7			Scaling factor*				
	Conducted Slot Average Power [dBm]		23.5	23.2	23.0	0.2	0.5	0.7	dB	
	Time-averaged power [dBm]		19.2	18.9	18.7	1.05	1.12	1.17	Lin	
			No testing required for this slot configuration.							
4-slot 8PSK EGPRS	Tuning Target + Tolerance [dBm]		22.5			Scaling factor*				
	Conducted Slot Average Power [dBm]		22.4	22.1	21.9	0.1	0.4	0.6	dB	
	Time-averaged power [dBm]		19.4	19.1	18.9	1.02	1.10	1.15	Lin	
	Right Cheek	Estimated SAR	-	0.225	-	-	0.247	-	-	-
		Full SAR	-	-	-	-	-	-		

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1900MHz Band Head SAR results HW2300**

Mode	Device orientation	SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Max Deviation (Estimated SAR - Full 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]		29.0			Scaling factor*				
	Conducted Slot Average Power [dBm]		28.9	28.8	28.5	0.1	0.2	0.5	dB	
	Time-averaged power [dBm]		19.9	19.8	19.5	1.02	1.05	1.12	Lin	
			No testing required for this slot configuration.							
2-slot GPRS	Tuning Target + Tolerance [dBm]		26.0			Scaling factor*				
	Conducted Slot Average Power [dBm]		25.9	25.6	25.5	0.1	0.4	0.5	dB	
	Time-averaged power [dBm]		19.9	19.6	19.5	1.02	1.10	1.12	Lin	
			No testing required for this slot configuration.							
3-slot GPRS	Tuning Target + Tolerance [dBm]		24.2			Scaling factor*				
	Conducted Slot Average Power [dBm]		24.1	23.9	23.8	0.1	0.3	0.4	dB	
	Time-averaged power [dBm]		19.8	19.6	19.5	1.02	1.07	1.10	Lin	
			No testing required for this slot configuration.							
4-slot GPRS	Tuning Target + Tolerance [dBm]		23.0			Scaling factor*				
	Conducted Slot Average Power [dBm]		23.0	22.7	22.5	0.0	0.3	0.5	dB	
	Time-averaged power [dBm]		20.0	19.7	19.5	1.00	1.07	1.12	Lin	
	Left Cheek	Estimated SAR	0.269	0.227	0.254	0.269	0.243	0.285	-	-
		Full SAR	-	-	-	-	-	-		
	Right Cheek	Estimated SAR	0.301	0.263	0.133	0.301	0.282	0.149	0.02	2
		Full SAR	0.316	-	-	**0.316**	-	-		

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2450MHz Head SAR results HW2201

Mode	Device orientation	SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Max Deviation (Estimated SAR - Full SAR) [W/kg]	Plot #
			Ch 1 2412.0 MHz	Ch 6 2437.0 MHz	Ch 11 2462.0 MHz	Ch 1 2412.0 MHz	Ch 6 2437.0 MHz	Ch 11 2462.0 MHz		
WLAN b-mode BPSK 1Mbps	Tuning Target + Tolerance [dBm]		18.0			Scaling factor*				
	Conducted Power [dBm]		16.9	17.0	17.0	1.1	1.0	1.0	dB	
	Time-averaged power [dBm]		16.9	17.0	17.0	1.30	1.26	1.26	Lin	
	Left Cheek	Estimated SAR	0.923	1.05	1.10	1.20	1.32	1.39	0.00	3
		Full SAR	-	-	1.10	-	-	1.39		
	Left Tilt	Estimated SAR	0.583	0.666	0.701	0.756	0.838	0.887	0.01	-
		Full SAR	-	-	0.707	-	-	0.894		
	Right Cheek	Estimated SAR	-	0.503	-	-	0.633	-	-	-
		Full SAR	-	-	-	-	-	-		
	Right Tilt	Estimated SAR	-	0.453	-	-	0.570	-	-	-
		Full SAR	-	-	-	-	-	-		
	Repeated SAR Left Cheek	Estimated SAR	-	-	-	-	-	-	-	-
		Full SAR	-	-	1.10	-	-	1.39		

Mode	Device orientation	SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Max Deviation (Estimated SAR - Full SAR) [W/kg]	Plot #
			Ch 2 2417 MHz	Ch 6 2437.0 MHz	Ch 10 2457.0 MHz	Ch 2 2417 MHz	Ch 6 2437.0 MHz	Ch 10 2457.0 MHz		
WLAN b-mode QPSK 5.5Mbps	Tuning Target + Tolerance [dBm]		18.0			Scaling factor*				
	Conducted Power [dBm]		17.5	17.6	17.5	0.5	0.4	0.5	dB	
	Time-averaged power [dBm]		17.5	17.6	17.5	1.12	1.10	1.12	Lin	
	Left Cheek	Estimated SAR	1.02	1.15	1.18	1.15	1.27	1.32	-	-
		Full SAR	-	-	-	-	-	-		

** Testing optimised based on HW2201

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

Test configuration	Max. Reported* 1g SAR results		
	WLAN 2450	4-slot GPRS850	4-slot GPRS1900
Head: Left, Cheek	1.39	0.951	0.285
Head: Left, Tilt	0.894	0.507	0.194
Head: Right, Cheek	0.633	0.771	0.316
Head: Right, Tilt	0.570	0.533	0.159

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

Test configuration	Max. Reported* 1g SAR results	
	4-slot GPRS850 + WLAN2450	4-slot GPRS1900 + WLAN2450
Head: Left, Cheek	**2.34**	**1.68**
Head: Left, Tilt	1.40	1.09
Head: Right, Cheek	1.40	0.949
Head: Right, Tilt	1.10	0.729

* Reported SAR values are scaled to, or measured at, upper limit of power tuning tolerance.

7.1.1 Simultaneous Transmission SAR Test Exclusion Procedures for Head Measurements

Simultaneous transmission SAR test exclusion procedures as described in KDB 447498 D01 v05.

Following table gives antenna pair SAR to peak location separation ratios for the transmitter combinations for which the sum of simultaneously transmitting 1g SAR was above limit (See “Max+Max Combined results” table in previous section).

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Antenna Pair SAR to Peak Location Separation Ratio

Left Cheek	WLAN 2450	4-slot GPRS850
X [mm]	29.3	66.2
Y [mm]	322.6	275.8
Z [mm]	-173.4	-174.6
DISTANCE [mm]	59.62	
MAX + MAX (Reported SAR)	2.34	
SAR to peak location separation ratio	**0.06**	
Left Cheek	**WLAN 2450**	**4-slot GPRS1900**
X [mm]	29.3	68.7
Y [mm]	322.6	250.1
Z [mm]	-173.4	-172.5
DISTANCE [mm]	82.54	
MAX + MAX (Reported SAR)	1.68	
SAR to peak location separation ratio	0.03	

All simultaneous transmitter configurations where all antenna pairs' SPLSR is equal to or below 0.04 are excluded from expanded zoom scan testing.

For all transmitters where SPLSR is >0.04, the following tables give individual and combined expanded zoom scan results

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850MHz Band Head SAR Expanded Volume Scan HW2201

Mode	Device orientation	SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Max Deviation (Estimated SAR - Full 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]		28.4			Scaling factor*				
	Conducted Slot Average Power [dBm]		28.2	28.1	28.0	0.2	0.3	0.4	dB	
	Time-averaged power [dBm]		25.2	25.1	25.0	1.05	1.07	1.10	Lin	
	Left Cheek	Estimated SAR	-	-	-	-	-	-	-	4
		Full SAR	-	-	0.816	-	-	0.895		

2450MHz Band Head SAR Expanded Volume Scan HW2201

Mode	Device orientation	SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Max Deviation (Estimated SAR - Full SAR) [W/kg]	Plot #
			Ch 1 2412.0 MHz	Ch 6 2437.0 MHz	Ch 11 2462.0 MHz	Ch 1 2412.0 MHz	Ch 6 2437.0 MHz	Ch 11 2462.0 MHz		
WLAN b-mode BPSK 1Mbps	Tuning Target + Tolerance [dBm]		18.0			Scaling factor*				
	Conducted Power [dBm]		16.9	17.0	17.0	1.1	1.0	1.0	dB	
	Time-averaged power [dBm]		16.9	17.0	17.0	1.30	1.26	1.26	Lin	
	Left Cheek	Estimated SAR	-	-	-	-	-	-	-	5
		Full SAR	-	-	1.03	-	-	1.30		

Simultaneous transmissions: Combined Head SAR results – SPEAG Combined Expanded Zoom scans results

Test configuration	Max. Reported*1g SAR results
	4-slot GPRS850 + WLAN2450
Head: Left, Cheek	1.36

Plots #6

Note:
* Reported SAR values are scaled to, or measured at, upper limit of power tuning tolerance.

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.

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7.1.2 Combined Head SAR data

The Combined SAR data given in the tables below has been voluntarily calculated and should be ignored for FCC certification.

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

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

Test configuration	Max. Reported* 1g SAR results	
	4-slot GPRS850 + WLAN2450	4-slot GPRS1900 + WLAN2450
Head: Left, Cheek	**1.52**	**1.41**
Head: Left, Tilt	-	-
Head: Right, Cheek	-	-
Head: Right, Tilt	-	-

Plot #7-8

* Reported SAR values are scaled to, or measured at, upper limit of power tuning tolerance.

Highest result within individual zoom scans is given in Section 1.2.1 for each transmitter. Highest result within contributing individual zoom scan or Speag combined algorithm results are given in Section 1.2.1 for each simultaneous transmitter combination.

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

850MHz Band Body SAR results HW2201

Mode	Device orientation		SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Max Deviation (Estimated SAR - Full 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]			28.4			Scaling factor*				
	Conducted Slot Average Power [dBm]			28.2	28.1	28.0	0.2	0.3	0.4	dB	
	Time-averaged power [dBm]			25.2	25.1	25.0	1.05	1.07	1.10	Lin	
	Back facing phantom	Without headset	Estimated SAR	0.918	0.991	1.09	0.961	1.06	1.20	0.01	9
			Full SAR	-	-	1.10	-	-	1.21		
		Headset WH-108	Estimated SAR	0.683	0.717	0.908	0.715	0.768	0.996	0.09	-
			Full SAR	0.705	0.803	0.950	0.738	0.860	1.04		
	Display facing phantom	Without headset	Estimated SAR	0.778	0.837	0.950	0.815	0.897	1.04	0.03	-
			Full SAR	-		0.983	-	-	1.08		
		Headset WH-108	Estimated SAR	-	0.608	-	-	0.651	-	0.01	-
			Full SAR	-	0.618	-	-	0.662	-		
	Repeated SAR: Back facing phantom, Without headset		Estimated SAR	-	-	-	-	-	-	-	-
			Full SAR	-	-	1.07	-	-	1.17		

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850MHz Band Body SAR results HW2300**

Mode	Device orientation		SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Max Deviation (Estimated SAR - Full 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		
2-slot GPRS	Tuning Target + Tolerance [dBm]			31.4			Scaling factor*				
	Conducted Slot Average Power [dBm]			31.2	30.9	31.1	0.2	0.5	0.3	dB	
	Time-averaged power [dBm]			25.2	24.9	25.1	1.05	1.12	1.07	Lin	
	Back facing phantom	Without headset	Estimated SAR	0.758	0.861	0.962	0.794	0.966	1.03	0.02	-
			Full SAR	-	-	0.982	-	-	1.05		
	Repeated SAR: Back facing phantom, Without headset		Estimated SAR	-	-	-	-	-	-	-	-
			Full SAR	-	-	0.980	-	-	1.05		

1900MHz Band Body SAR results HW2201

Mode	Device orientation		SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Max Deviation (Estimated SAR - Full 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]			23.0			Scaling factor*				
	Conducted Slot Average Power [dBm]			22.9	22.7	22.4	0.1	0.3	0.6	dB	
	Time-averaged power [dBm]			19.9	19.7	19.4	1.02	1.07	1.15	Lin	
	Back facing phantom	Without headset	Estimated SAR	-	0.515	-	-	0.552	-	0.00	-
			Full SAR	-	0.518	-	-	0.555	-		
		Headset WH-108	Estimated SAR	0.328	0.549	0.806	0.336	0.588	0.925	0.01	-
			Full SAR	-	-	0.817	-	-	0.938		
	Display facing phantom	Without headset	Estimated SAR	-	0.399	-	-	0.428	-	-	-
			Full SAR	-	-	-	-	-	-		
		Headset WH-108	Estimated SAR	-	0.407	-	-	0.436	-	-	-
			Full SAR	-	-	-	-	-	-		
	Repeated SAR Back facing phantom Headset WH-108		Estimated SAR	-	-	-	-	-	-	-	-
			Full SAR	-	-	0.828	-	-	0.951		

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1900MHz Band Body SAR results HW2300**

Mode	Device orientation		SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Max Deviation (Estimated SAR - Full 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]			23.0			Scaling factor*				
	Conducted Slot Average Power [dBm]			23.0	22.7	22.5	0.0	0.3	0.5	dB	
	Time-averaged power [dBm]			20.0	19.7	19.5	1.00	1.07	1.12	Lin	
	Back facing phantom	Headset WH-108	Estimated SAR	0.362	0.598	0.942	0.362	0.641	1.06	0.01	10
			Full SAR	-	-	0.956	-	-	**1.07**		
	Repeated SAR Back facing phantom Headset WH-108		Estimated SAR	-	-	-	-	-	-	-	-
			Full SAR	-	-	0.955	-	-	1.07		

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2450MHz Body SAR results HW2201

Mode	Device orientation		SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Max Deviation (Estimated SAR - Full SAR) [W/kg]	Plot #
				Ch 1 2412.0 MHz	Ch 6 2437.0 MHz	Ch 11 2462.0 MHz	Ch 1 2412.0 MHz	Ch 6 2437.0 MHz	Ch 11 2462.0 MHz		
WLAN b-mode BPSK 1 Mbps	Tuning Target + Tolerance [dBm]			18.0			Scaling factor*				
	Conducted Power [dBm]			16.9	17.0	17.0	1.1	1.0	1.0	dB	
	Time-averaged power [dBm]			16.9	17.0	17.0	1.30	1.26	1.26	Lin	
	Back facing phantom	Without headset	Estimated SAR	0.107	0.118	0.131	0.139	0.149	0.166	0.00	11
			Full SAR	-	-	0.130	-	-	**0.164**		
		Headset WH-108	Estimated SAR	-	0.106	-	-	0.133	-	-	-
			Full SAR	-	-	-	-	-	-		
	Display facing phantom	Without headset	Estimated SAR	-	0.110	-	-	0.138	-	-	-
			Full SAR	-	-	-	-	-	-		
		Headset WH-108	Estimated SAR	-	0.099	-	-	0.124	-	-	-
			Full SAR	-	-	-	-	-	-		
Mode	Device orientation		SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Max Deviation (Estimated SAR - Full SAR) [W/kg]	Plot #
				Ch 2 2417 MHz	Ch 6 2437.0 MHz	Ch 10 2457.0 MHz	Ch 2 2417 MHz	Ch 6 2437.0 MHz	Ch 10 2457.0 MHz		
WLAN b-mode QPSK 5.5 Mbps	Tuning Target + Tolerance [dBm]			18.0			Scaling factor*				
	Conducted Power [dBm]			17.5	17.6	17.5	0.5	0.4	0.5	dB	
	Time-averaged power [dBm]			17.5	17.6	17.5	1.12	1.10	1.12	Lin	
	Back facing phantom	Without headset	Estimated SAR	0.115	0.128	0.135	0.129	0.141	0.151	-	-
			Full SAR	-	-	-	-	-	-		

** Testing optimised based on HW2201

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

Test configuration	Max. Reported*1g SAR results		
	WLAN 2450	4-slot GPRS850	4-slot GPRS1900
Body: Back facing phantom, Without Headset	0.164	1.21	0.555
Body: Back facing phantom, Headset WH-108	0.133	1.04	1.07
Body: Display facing phantom, Without Headset	0.138	1.08	0.428
Body: Display facing phantom, Headset WH-108	0.124	0.662	0.436

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

Test configuration	Max. Reported*1g SAR results	
	4-slot GPRS850 + WLAN2450	4-slot GPRS1900 + WLAN2450
Body: Back facing phantom, Without Headset	**1.37**	0.719
Body: Back facing phantom, Headset WH-108	1.17	**1.20**
Body: Display facing phantom, Without Headset	1.22	0.566
Body: Display facing phantom, Headset WH-108	0.786	0.560

Note: Simultaneous Transmission Procedures as described in KDB648474 D04 v01 are not required for this product.

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7.2.1 Combined Body SAR data

The Combined SAR data given in the tables below has been voluntarily calculated and should be ignored for FCC certification.

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

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

Test configuration	Max. Reported*1g SAR results	
	4-slot GPRS850 + WLAN2450	4-slot GPRS1900 + WLAN2450
Body: Back facing phantom, Without Headset	**1.25**	-
Body: Back facing phantom, Headset WH-108	-	**1.08**
Body: Display facing phantom, Without Headset	-	-
Body: Display facing phantom, Headset WH-108	-	-

* Reported SAR values are scaled to, or measured at, upper limit of power tuning tolerance.

Highest result within individual zoom scans is given in Section 1.2.2 for each transmitter. Highest result within contributing individual zoom scan or Speag combined algorithm results are given in Section 1.2.2 for each simultaneous transmitter combination.

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7.3 The measured Body SAR value of Wireless Router mode at 10.0mm separation distance

850MHz Band Wireless Router SAR results HW2201

Mode	Device orientation	SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Max Deviation (Estimated SAR - Full 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]		32.4			Scaling factor*				
	Conducted Slot Average Power [dBm]		32.2	32.2	32.2	0.2	0.2	0.2	dB	
	Time-averaged power [dBm]		23.2	23.2	23.2	1.05	1.05	1.05	Lin	
			No testing required for this slot configuration.							
2-slot GPRS	Tuning Target + Tolerance [dBm]		29.4			Scaling factor*				
	Conducted Slot Average Power [dBm]		29.2	29.1	29.1	0.2	0.3	0.3	dB	
	Time-averaged power [dBm]		23.2	23.1	23.1	1.05	1.07	1.07	Lin	
			No testing required for this slot configuration.							
3-slot GPRS	Tuning Target + Tolerance [dBm]		27.6			Scaling factor*				
	Conducted Slot Average Power [dBm]		27.3	27.3	27.2	0.3	0.3	0.4	dB	
	Time-averaged power [dBm]		23.0	23.0	22.9	1.07	1.07	1.10	Lin	
			No testing required for this slot configuration.							
4-slot GPRS	Tuning Target + Tolerance [dBm]		26.4			Scaling factor*				
	Conducted Slot Average Power [dBm]		26.2	26.2	26.1	0.2	0.2	0.3	dB	
	Time-averaged power [dBm]		23.2	23.2	23.1	1.05	1.05	1.07	Lin	
	Back facing phantom	Estimated SAR	0.719	0.772	0.839	0.753	0.808	0.899	0.04	12
		Full SAR	-	-	0.883	-	-	**0.946**		
	Display facing phantom	Estimated SAR	-	0.700	-	-	0.733	-	0.00	-
		Full SAR	-	0.697	-	-	0.730	-		
	Top edge facing phantom	Estimated SAR	-	0.023	-	-	0.024	-	-	-
		Full SAR	-	-	-	-	-	-		
	Bottom edge facing phantom	Estimated SAR	-	0.046	-	-	0.048	-	-	-
		Full SAR	-	-	-	-	-	-		
	Left edge facing phantom	Estimated SAR	-	0.470	-	-	0.492	-	-	-
		Full SAR	-	-	-	-	-	-		
	Right edge facing phantom	Estimated SAR	-	0.464	-	-	0.486	-	-	-
		Full SAR	-	-	-	-	-	-		
	Repeated SAR Back facing phantom	Estimated SAR	-	-	-	-	-	-	-	-
		Full SAR	-	-	0.881	-	-	0.944		

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850MHz Band Wireless Router SAR results HW2300**

Mode	Device orientation	SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Max Deviation (Estimated SAR - Full 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]		32.4			Scaling factor*				
	Conducted Slot Average Power [dBm]		32.0	31.9	32.0	0.4	0.5	0.4	dB	
	Time-averaged power [dBm]		23.0	22.9	23.0	1.10	1.12	1.10	Lin	
	Back facing phantom	Estimated SAR	0.620	0.716	0.769	0.680	0.803	0.843	0.03	-
		Full SAR	-	-	0.798	-	-	0.875		
2-slot GPRS	Tuning Target + Tolerance [dBm]		29.4			Scaling factor*				
	Conducted Slot Average Power [dBm]		28.8	28.6	28.9	0.6	0.8	0.5	dB	
	Time-averaged power [dBm]		22.8	22.6	22.9	1.15	1.20	1.12	Lin	
			No testing required for this slot configuration.							
3-slot GPRS	Tuning Target + Tolerance [dBm]		27.6			Scaling factor*				
	Conducted Slot Average Power [dBm]		27.1	26.8	27.0	0.5	0.8	0.6	dB	
	Time-averaged power [dBm]		22.8	22.5	22.7	1.12	1.20	1.15	Lin	
			No testing required for this slot configuration.							
4-slot GPRS	Tuning Target + Tolerance [dBm]		26.4			Scaling factor*				
	Conducted Slot Average Power [dBm]		25.8	25.6	25.9	0.6	0.8	0.5	dB	
	Time-averaged power [dBm]		22.8	22.6	22.9	1.15	1.20	1.12	Lin	
			No testing required for this slot configuration.							

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1900MHz Band Wireless Router SAR results HW2201

Mode	Device orientation	SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Max Deviation (Estimated SAR - Full 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]		23.9			Scaling factor*				
	Conducted Slot Average Power [dBm]		23.7	23.5	23.5	0.2	0.4	0.4	dB	
	Time-averaged power [dBm]		14.7	14.5	14.5	1.05	1.10	1.10	Lin	
			No testing required for this slot configuration.							
2-slot GPRS	Tuning Target + Tolerance [dBm]		21.9			Scaling factor*				
	Conducted Slot Average Power [dBm]		21.7	21.5	21.5	0.2	0.4	0.4	dB	
	Time-averaged power [dBm]		15.7	15.5	15.5	1.05	1.10	1.10	Lin	
	Back facing phantom	Estimated SAR	-	0.583	-	-	0.639	-	0.03	-
		Full SAR	-	0.614	-	-	0.673	-		
	Display facing phantom	Estimated SAR	-	0.438	-	-	0.480	-	-	-
		Full SAR	-	-	-	-	-	-		
	Top edge facing phantom	Estimated SAR	-	0.014	-	-	0.016	-	-	-
		Full SAR	-	-	-	-	-	-		
	Bottom edge facing phantom	Estimated SAR	0.462	0.834	1.07	0.484	0.914	1.17	0.01	-
		Full SAR	-	-	1.08	-	-	1.18		
	Left edge facing phantom	Estimated SAR	-	0.062	-	-	0.068	-	-	-
		Full SAR	-	-	-	-	-	-		
	Right edge facing phantom	Estimated SAR	-	0.258	-	-	0.283	-	-	-
		Full SAR	-	-	-	-	-	-		
	Repeated SAR Bottom edge facing phantom	Estimated SAR	-	-	-	-	-	-	-	-
		Full SAR	-	-	1.07	-	-	1.17		
3-slot GPRS	Tuning Target + Tolerance [dBm]		19.9			Scaling factor*				
	Conducted Slot Average Power [dBm]		19.8	19.6	19.4	0.1	0.3	0.5	dB	
	Time-averaged power [dBm]		15.5	15.3	15.1	1.02	1.07	1.12	Lin	
			No testing required for this slot configuration.							
4-slot GPRS	Tuning Target + Tolerance [dBm]		17.9			Scaling factor*				
	Conducted Slot Average Power [dBm]		17.7	17.6	17.5	0.2	0.3	0.4	dB	
	Time-averaged power [dBm]		14.7	14.6	14.5	1.05	1.07	1.10	Lin	
			No testing required for this slot configuration.							

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1900MHz Band Wireless Router SAR results HW2300**

Mode	Device orientation	SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Max Deviation (Estimated SAR - Full 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]		23.9			Scaling factor*				
	Conducted Slot Average Power [dBm]		23.2	23.0	23.0	0.7	0.9	0.9	dB	
	Time-averaged power [dBm]		14.2	14.0	14.0	1.17	1.23	1.23	Lin	
			No testing required for this slot configuration.							
2-slot GPRS	Tuning Target + Tolerance [dBm]		21.9			Scaling factor*				
	Conducted Slot Average Power [dBm]		21.4	21.1	21.1	0.5	0.8	0.8	dB	
	Time-averaged power [dBm]		15.4	15.1	15.1	1.12	1.20	1.20	Lin	
	Bottom edge facing phantom	Estimated SAR	0.310	0.512	0.990	0.348	0.616	1.19	0.01	13
		Full SAR	-	-	0.996	-	-	1.20		
	Repeated SAR Bottom edge facing phantom	Estimated SAR	-	-	-	-	-	-	-	-
		Full SAR	-	-	0.995	-	-	1.20		
3-slot GPRS	Tuning Target + Tolerance [dBm]		19.9			Scaling factor*				
	Conducted Slot Average Power [dBm]		19.5	19.2	19.0	0.4	0.7	0.9	dB	
	Time-averaged power [dBm]		15.2	14.9	14.7	1.10	1.17	1.23	Lin	
			No testing required for this slot configuration.							
4-slot GPRS	Tuning Target + Tolerance [dBm]		17.9			Scaling factor*				
	Conducted Slot Average Power [dBm]		17.4	17.1	17.2	0.5	0.8	0.7	dB	
	Time-averaged power [dBm]		14.4	14.1	14.2	1.12	1.20	1.17	Lin	
			No testing required for this slot configuration.							

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2450MHz Wireless Router SAR results HW2201

Mode	Test configuration	SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Max Deviation (Estimated SAR - Full SAR) [W/kg]	Plot #
			Ch 1 2412.0 MHz	Ch 6 2437.0 MHz	Ch 11 2462.0 MHz	Ch 1 2412.0 MHz	Ch 6 2437.0 MHz	Ch 11 2462.0 MHz		
WLAN b-mode BPSK 1 Mbps	Tuning Target + Tolerance [dBm]		18.0			Scaling factor*				
	Conducted Power [dBm]		16.9	17.0	17.0	1.1	1.0	1.0	dB	
	Time-averaged power [dBm]		16.9	17.0	17.0	1.30	1.26	1.26	Lin	
	Back facing phantom	Estimated SAR	0.221	0.244	0.248	0.287	0.307	0.314	-	-
		Full SAR	-	-	-	-	-	-		
	Display facing phantom	Estimated SAR	-	0.181	-	-	0.228	-	-	-
		Full SAR	-	-	-	-	-	-		
	Top edge facing phantom	Estimated SAR	-	0.124	-	-	0.156	-	-	-
		Full SAR	-	-	-	-	-	-		
	Bottom edge facing phantom	Estimated SAR	-	0.010	-	-	0.013	-	-	-
		Full SAR	-	-	-	-	-	-		
	Left edge facing phantom	Estimated SAR	-	0.057	-	-	0.072	-	-	-
		Full SAR	-	-	-	-	-	-		
	Right edge facing phantom	Estimated SAR	-	0.128	-	-	0.161	-	-	-
		Full SAR	-	-	-	-	-	-		

Mode	Test configuration	SAR measurement	Measured 1g SAR [W/kg]			Reported* 1g SAR [W/kg]			Max Deviation (Estimated SAR - Full SAR) [W/kg]	Plot #
			Ch 2 2417 MHz	Ch 6 2437.0 MHz	Ch 10 2457.0 MHz	Ch 2 2417 MHz	Ch 6 2437.0 MHz	Ch 10 2457.0 MHz		
WLAN b-mode BPSK 5.5 Mbps	Tuning Target + Tolerance [dBm]		18.0			Scaling factor*				
	Conducted Power [dBm]		17.5	17.6	17.5	0.5	0.4	0.5	dB	
	Time-averaged power [dBm]		17.5	17.6	17.5	1.12	1.10	1.12	Lin	
	Back facing phantom	Estimated SAR	0.240	0.256	0.284	0.270	0.282	0.319	0.01	14
		Full SAR			0.297	-	-	**0.333**		

** Testing optimised based on HW2201

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

Test configuration	Max. Reported* 1g SAR results		
	WLAN2450	4-slot GPRS850	2-slot GPRS1900
Back facing phantom	0.333	0.946	0.673
Display facing phantom	0.228	0.730	0.480
Top edge facing phantom	0.156	0.024	0.016
Bottom edge facing phantom	0.013	0.048	1.20
Left edge facing phantom	0.072	0.492	0.068
Right edge facing phantom	0.161	0.486	0.283

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

Test configuration	Max. Reported* 1g SAR results	
	4-slot GPRS850 + WLAN2450	2-slot GPRS1900 + WLAN2450
Back facing phantom	**1.28**	1.01
Display facing phantom	0.958	0.708
Top edge facing phantom	0.180	0.172
Bottom edge facing phantom	0.061	**1.21**
Left edge facing phantom	0.564	0.140
Right edge facing phantom	0.647	0.444

Note: Simultaneous Transmission Procedures as described in KDB447498 D01 are not required for this product.

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7.3.1 Area scan based combined Body SAR data of Wireless Router mode

The Combined SAR data given in the tables below has been voluntarily calculated and should be ignored for FCC certification.

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

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

Test configuration	Max. Reported* 1g SAR results	
	4-slot GPRS850 + WLAN2450	2-slot GPRS1900 + WLAN2450
Back facing phantom	**0.996**	-
Display facing phantom	-	-
Top edge facing phantom	-	-
Bottom edge facing phantom	-	**1.19**
Left edge facing phantom	-	-
Right edge facing phantom	-	-

* Reported SAR values are scaled to, or measured at, upper limit of power tuning tolerance.

Highest result within individual zoom scans is given in Section 1.2.3 for each transmitter. Highest result within contributing individual zoom scan or Speag combined algorithm results are given in Section 1.2.3 for each simultaneous transmitter combination

Plots of the Measurement scans are given in Appendix B.

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APPENDIX A: SYSTEM CHECKING SCANS

Plot #1

Date/Time: 2014-02-04 12:00:59

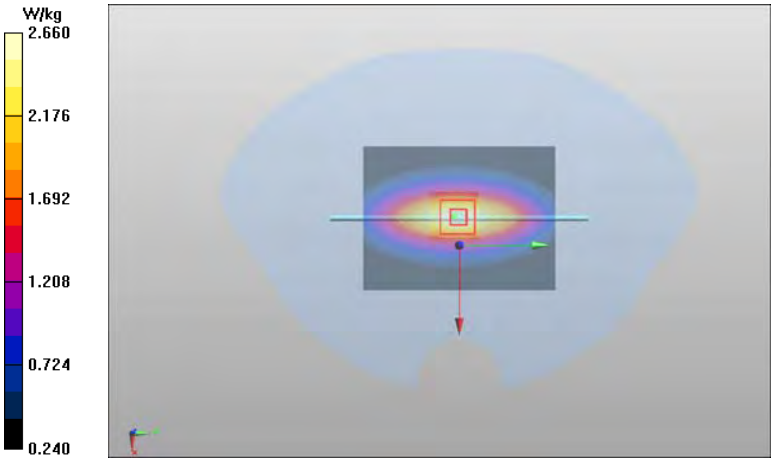
Test Laboratory: TCC Nokia
Type: D835V2; Serial: D835V2 - SN:480

Communication System: CW835
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL835; Medium Notes: t= 21.5 C
Medium parameters used: f = 835 MHz; σ = 0.896 S/m; ε_r = 41.06; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY Configuration:
- Probe: ES3DV3 - SN3194
- ConvF(6.12, 6.12, 6.12); Calibrated: 2013-11-14;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn538; Calibrated: 2013-11-19
- Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1179
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.9 (7117)

d=15mm, Pin=250mW/Area Scan (61x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 52.952 V/m
Fast SAR: SAR(1 g) = 2.32 W/kg
Fast SAR(10 g) = 1.56 W/kg
Maximum value of SAR (interpolated) = 2.66 W/kg

d=15mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 52.952 V/m
Peak SAR (extrapolated) = 3.34 W/kg
SAR(1 g) = 2.28 W/kg
SAR(10 g) = 1.5 W/kg
Power Drift = 0.02 dB
Maximum value of SAR (measured) = 2.66 W/kg



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Plot #2

Date/Time: 2014-01-29 06:38:14

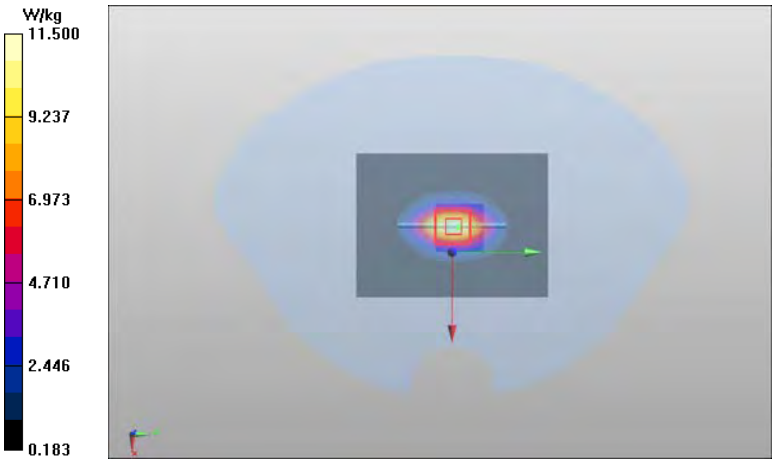
Test Laboratory: TCC Nokia
Type: D1900V2; Serial: D1900V2 - SN:5d013

Communication System: CW1900
Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL 1900; Medium Notes: t= 21.5 C
Medium parameters used: f = 1900 MHz; σ = 1.397 S/m; ε_r = 39.34; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY Configuration:
- Probe: ES3DV3 - SN3131
- ConvF(4.98, 4.98, 4.98); Calibrated: 2013-06-18;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn793; Calibrated: 2013-06-10
- Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1449
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

d=10mm, Pin=250mW/Area Scan (61x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 87.278 V/m
Fast SAR: SAR(1 g) = 9.35 W/kg
Fast SAR(10 g) = 4.81 W/kg
Maximum value of SAR (interpolated) = 11.8 W/kg

d=10mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 87.278 V/m
Peak SAR (extrapolated) = 16.8 W/kg
SAR(1 g) = 9.3 W/kg
SAR(10 g) = 4.85 W/kg
Power Drift = 0.05 dB
Maximum value of SAR (measured) = 11.5 W/kg



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Plot #3

Date/Time: 2014-02-04 09:01:51

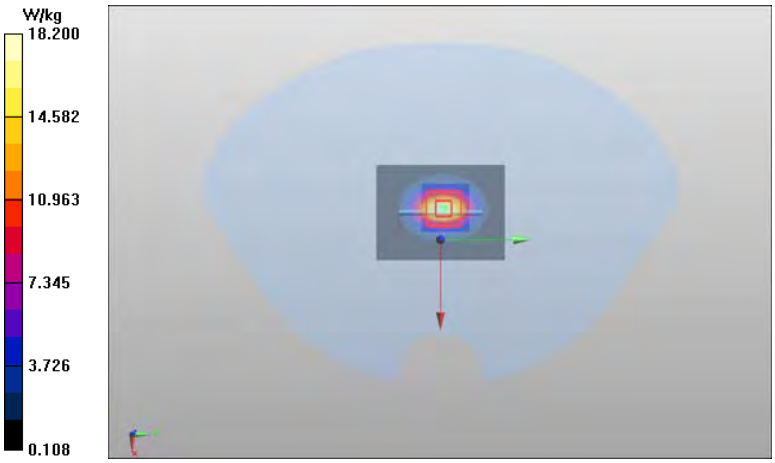
Test Laboratory: TCC Nokia
Type: D2450V2; Serial: D2450V2 - SN:749

Communication System: CW2450
Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL2450; Medium Notes: t=21.3 C
Medium parameters used: f = 2450 MHz; σ = 1.808 S/m; ε_r = 38.47; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY Configuration:
- Probe: EX3DV4 - SN3960
- ConvF(7.39, 7.39, 7.39); Calibrated: 2013-12-10;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1302; Calibrated: 2013-11-08
- Phantom: #4 SAM, SAR4 ; Type: QD000P40CD; Serial:
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

d=10mm, Pin=250mW/Area Scan (61x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 91.242 V/m
Fast SAR: SAR(1 g) = 13.8 W/kg
Fast SAR(10 g) = 6.08 W/kg
Maximum value of SAR (interpolated) = 18.6 W/kg

d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 91.242 V/m
Peak SAR (extrapolated) = 28.7 W/kg
SAR(1 g) = 13.7 W/kg
SAR(10 g) = 6.34 W/kg
Power Drift = 0.02 dB
Maximum value of SAR (measured) = 18.2 W/kg



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Plot #4

Date/Time: 2014-02-03 08:04:15

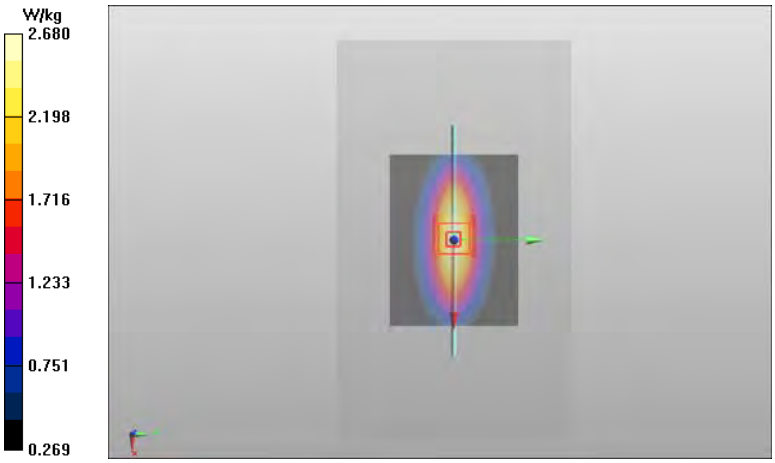
Test Laboratory: TCC Nokia
Type: D835V2; Serial: D835V2 - SN:480

Communication System: CW835
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: BSL835; Medium Notes: t= 21.7 C
Medium parameters used: f = 835 MHz; σ = 0.976 S/m; ε_r = 54.035; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY Configuration:
- Probe: ES3DV3 - SN3194
- ConvF(6.05, 6.05, 6.05); Calibrated: 2013-11-14;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn538; Calibrated: 2013-11-19
- Phantom: SAM 3 Triple Phantom 5.1C; Type: QD 000 P51 CA;
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.9 (7117)

d=15mm, Pin=250mW/Area Scan (81x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 51.457 V/m
Fast SAR: SAR(1 g) = 2.36 W/kg
Fast SAR(10 g) = 1.58 W/kg
Maximum value of SAR (interpolated) = 2.71 W/kg

d=15mm, Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 51.457 V/m
Peak SAR (extrapolated) = 3.33 W/kg
SAR(1 g) = 2.31 W/kg
SAR(10 g) = 1.53 W/kg
Power Drift = -0.01 dB
Maximum value of SAR (measured) = 2.68 W/kg



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Plot #5

Date/Time: 2014-01-30 07:50:31

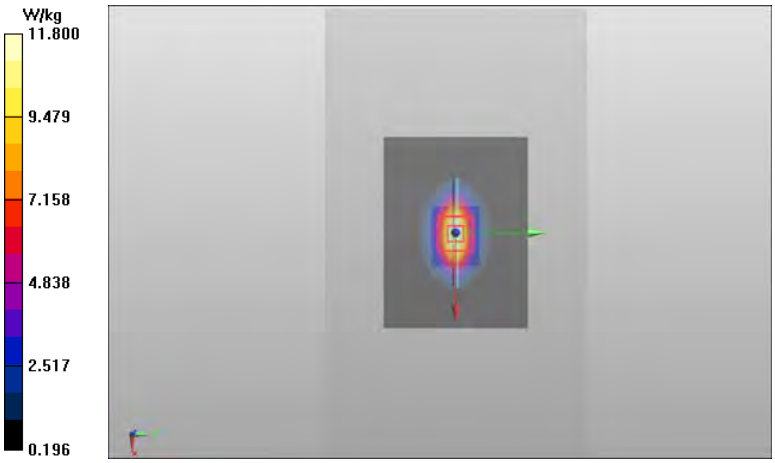
Test Laboratory: TCC Nokia
Type: D1900V2; Serial: D1900V2 - SN:5d013

Communication System: CW1900
Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: BSL1900; Medium Notes: t= 21.2 C
Medium parameters used: f = 1900 MHz; σ = 1.522 S/m; ε_r = 51.853; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY Configuration:
- Probe: ES3DV3 - SN3131
- ConvF(4.62, 4.62, 4.62); Calibrated: 2013-06-18;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn793; Calibrated: 2013-06-10
- Phantom: SAM 3 Triple Phantom 5.1C; Type: QD 000 P51 CA;
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

d=10mm, Pin=250mW/Area Scan (81x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 86.098 V/m
Fast SAR: SAR(1 g) = 9.37 W/kg
Fast SAR(10 g) = 4.71 W/kg
Maximum value of SAR (interpolated) = 12.0 W/kg

d=10mm, Pin=250mW/Zoom Scan (6x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 86.098 V/m
Peak SAR (extrapolated) = 16.0 W/kg
SAR(1 g) = 9.42 W/kg
SAR(10 g) = 5 W/kg
Power Drift = 0.01 dB
Maximum value of SAR (measured) = 11.8 W/kg



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Plot #6

Date/Time: 2014-01-29 07:01:45

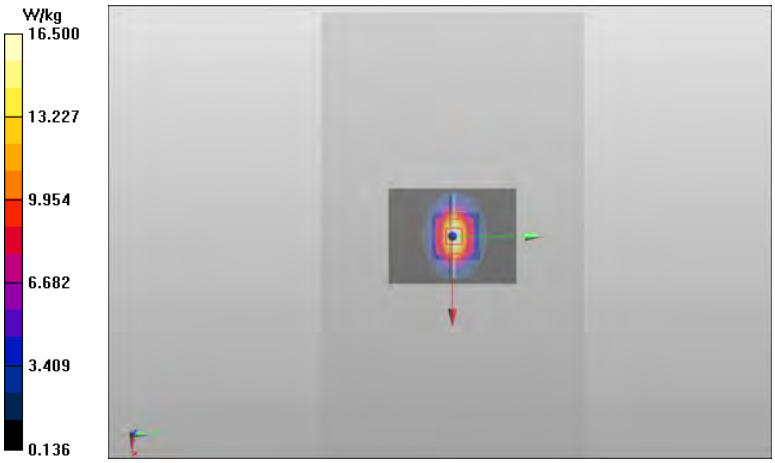
Test Laboratory: TCC Nokia
Type: D2450V2; Serial: D2450V2 - SN:749

Communication System: CW2450
Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: BSL2450; Medium Notes: t= 21.4 C
Medium parameters used: f = 2450 MHz; σ = 1.944 S/m; ε_r = 51.499; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY Configuration:
- Probe: EX3DV4 - SN3960
- ConvF(7.44, 7.44, 7.44); Calibrated: 2013-12-10;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1302; Calibrated: 2013-11-08
- Phantom: #2 Triple, SAR4; Type: QD 000 P51 CA;
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

d=10mm, Pin=250mW/Area Scan (61x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 85.547 V/m
Fast SAR: SAR(1 g) = 12.5 W/kg
Fast SAR(10 g) = 5.41 W/kg
Maximum value of SAR (interpolated) = 16.7 W/kg

d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 85.547 V/m
Peak SAR (extrapolated) = 25.5 W/kg
SAR(1 g) = 12.5 W/kg
SAR(10 g) = 5.88 W/kg
Power Drift = -0.01 dB
Maximum value of SAR (measured) = 16.5 W/kg



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APPENDIX B: MEASUREMENT SCANS

Plot #1

Date/Time: 2014-01-31 10:19:54

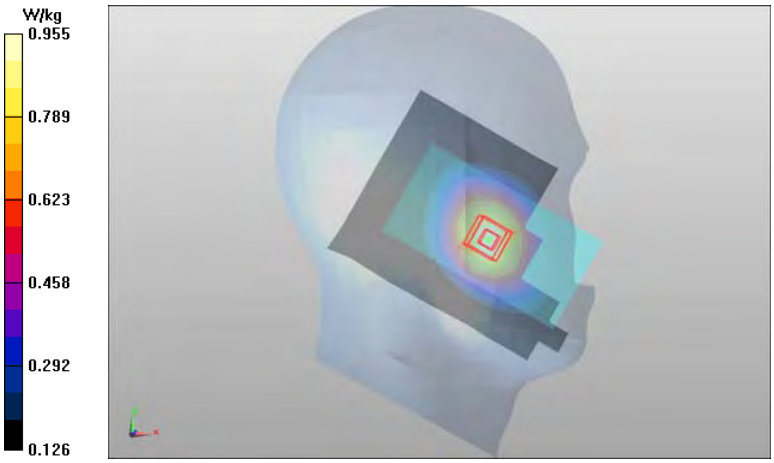
Test Laboratory: TCC Nokia
Type: RM-976; Serial: 004402/47/596097/1

Communication System: 4-slot GPRS850
Frequency: 848.8 MHz; Duty Cycle: 1:2.09991
Medium: HSL835; Medium Notes: t= 22.0 C
Medium parameters used: f = 849 MHz; σ = 0.897 S/m; ε_r = 40.074; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY Configuration:
- Probe: ES3DV3 - SN3194
- ConvF(6.12, 6.12, 6.12); Calibrated: 2013-11-14;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn538; Calibrated: 2013-11-19
- Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1179
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.9 (7117)

4-slot GPRS850 - Left/Cheek - High - Repeated/Area Scan (81x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 32.633 V/m
Fast SAR: SAR(1 g) = 0.835 W/kg
Fast SAR(10 g) = 0.585 W/kg
Maximum value of SAR (interpolated) = 0.945 W/kg

4-slot GPRS850 - Left/Cheek - High - Repeated/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 32.633 V/m
Peak SAR (extrapolated) = 1.08 W/kg
SAR(1 g) = 0.867 W/kg
SAR(10 g) = 0.659 W/kg
Power Drift = -0.03 dB
Maximum value of SAR (measured) = 0.955 W/kg



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Plot #2

Date/Time: 2014-03-04 13:25:16

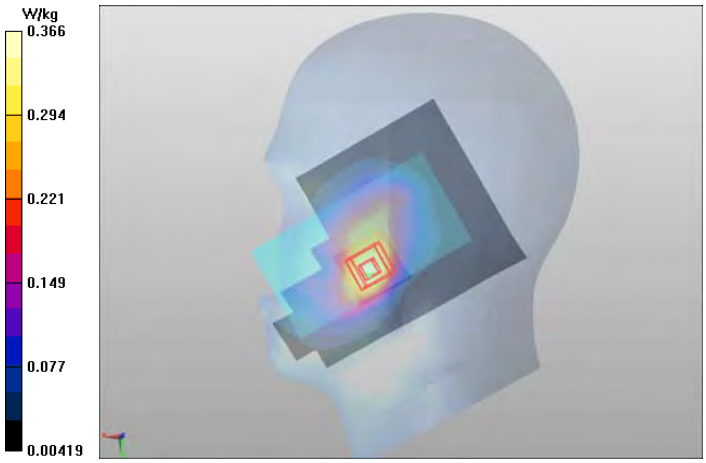
Test Laboratory: TCC Nokia
Type: RM-976; Serial: 004402/47/729490/8

Communication System: 4-slot GPRS1900
Frequency: 1850.2 MHz; Duty Cycle: 1:2.09991
Medium: HSL1900; Medium Notes: t= 21.5 C
Medium parameters used (interpolated): f = 1850.2 MHz; σ = 1.336 S/m; ε_r = 39.097; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY Configuration:
- Probe: ES3DV3 - SN3131
- ConvF(4.98, 4.98, 4.98); Calibrated: 2013-06-18;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn793; Calibrated: 2013-06-10
- Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1449
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

4-slot GPRS1900 - Right/Cheek - Low/Area Scan (81x121x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 16.540 V/m
Fast SAR: SAR(1 g) = 0.301 W/kg
Fast SAR(10 g) = 0.179 W/kg
Maximum value of SAR (interpolated) = 0.365 W/kg

4-slot GPRS1900 - Right/Cheek - Low/Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 16.861 V/m
Peak SAR (extrapolated) = 0.467 W/kg
SAR(1 g) = 0.316 W/kg
SAR(10 g) = 0.200 W/kg
Power Drift = 0.02 dB
Maximum value of SAR (measured) = 0.366 W/kg



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Plot #3

Date/Time: 2014-01-27 10:08:25

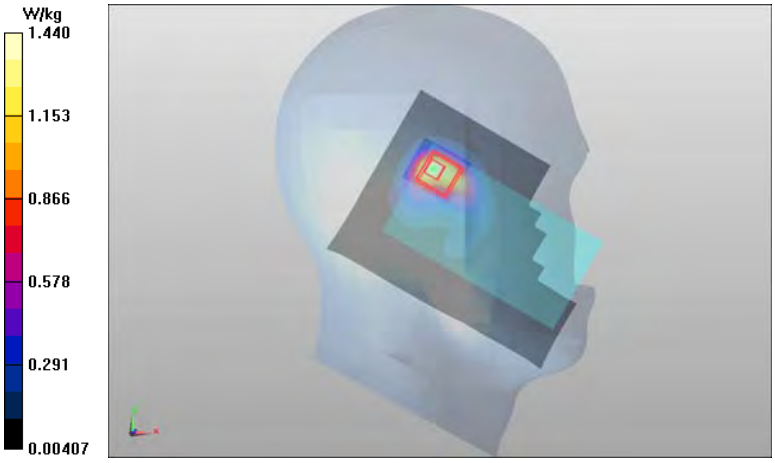
Test Laboratory: TCC Nokia
Type: RM-976; Serial: 004402/47/596099/7

Communication System: WLAN2450
Frequency: 2462 MHz; Duty Cycle: 1:1
Medium: HSL2450; Medium Notes: t= 21.1 C
Medium parameters used: f = 2462 MHz; σ = 1.81 S/m; ε_r = 38.585; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY Configuration:
- Probe: EX3DV4 - SN3960
- ConvF(7.39, 7.39, 7.39); Calibrated: 2013-12-10;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1302; Calibrated: 2013-11-08
- Phantom: #4 SAM, SAR4 ; Type: QD000P40CD
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

WLAN2450 b-mode - Left/Cheek - Channel 11 - BPSK 1 Mbps/Area Scan (121x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 28.253 V/m
Fast SAR: SAR(1 g) = 1.1 W/kg
Fast SAR(10 g) = 0.512 W/kg
Maximum value of SAR (interpolated) = 1.54 W/kg

WLAN2450 b-mode - Left/Cheek - Channel 11 - BPSK 1 Mbps/Zoom Scan (7x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 28.253 V/m
Peak SAR (extrapolated) = 2.35 W/kg
SAR(1 g) = 1.1 W/kg
SAR(10 g) = 0.549 W/kg
Power Drift = 0.03 dB
Maximum value of SAR (measured) = 1.44 W/kg



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Plot #4 – EXPANDED VOLUME SCAN

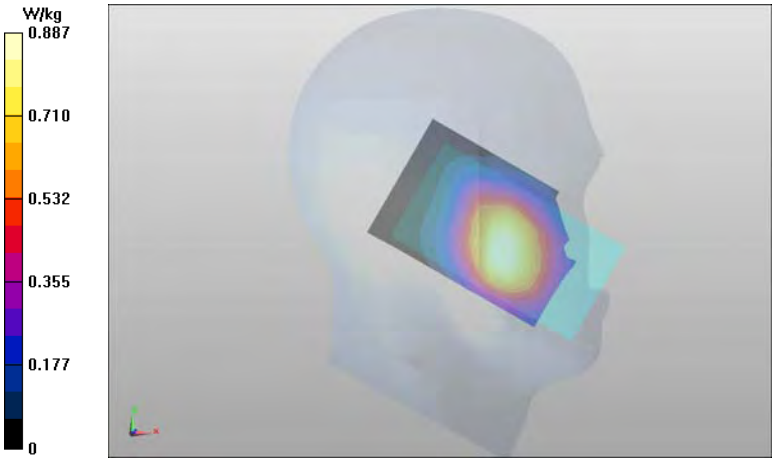
Date/Time: 2014-02-04 13:00:17

Test Laboratory: TCC Nokia
Type: RM-976; Serial: 004402/47/596097/1

Communication System: 4-slot GPRS850
Frequency: 848.8 MHz; Duty Cycle: 1:2.09991
Medium: HSL835; Medium Notes: t= 21.5 C
Medium parameters used: f = 849 MHz; σ = 0.906 S/m; ε_r = 40.929; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY Configuration:
- Probe: ES3DV3 - SN3194
- ConvF(6.12, 6.12, 6.12); Calibrated: 2013-11-14;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn538; Calibrated: 2013-11-19
- Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1179
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.9 (7117)

4-slot GPRS850 - Left/Cheek - High/Volume Scan (18x26x7): Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 30.023 V/m
Peak SAR (extrapolated) = 1.02 W/kg
SAR(1 g) = 0.816 W/kg
SAR(10 g) = 0.626 W/kg
Power Drift = 0.17 dB
Total Absorbed Power = 0.0672 W
Maximum value of SAR (measured) = 0.887 W/kg



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Plot #5 – EXPANDED VOLUME SCAN

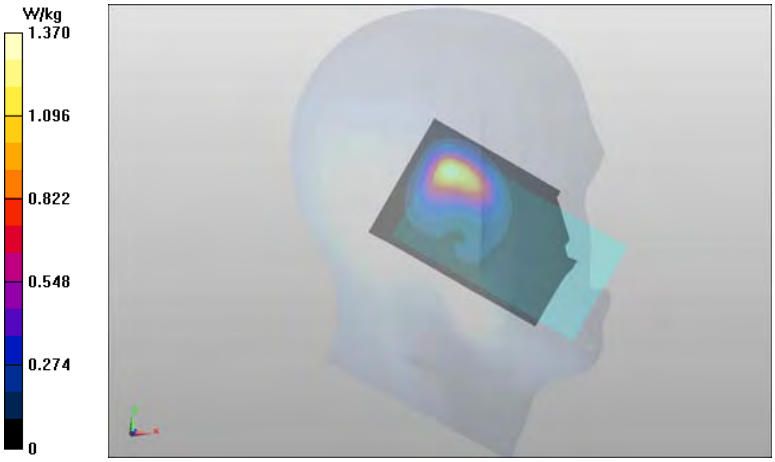
Date/Time: 2014-02-04 09:46:02

Test Laboratory: TCC Nokia
Type: RM-976; Serial: 004402/47/596099/7

Communication System: WLAN2450
Frequency: 2462 MHz; Duty Cycle: 1:1
Medium: HSL2450; Medium Notes: t=21.3 C
Medium parameters used: f = 2462 MHz; σ = 1.823 S/m; ε_r = 38.447; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY Configuration:
- Probe: EX3DV4 - SN3960
- ConvF(7.39, 7.39, 7.39); Calibrated: 2013-12-10;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1302; Calibrated: 2013-11-08
- Phantom: #4 SAM, SAR4 ; Type: QD000P40CD
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

WLA2450 b-mode - Left/Cheek - Channel 11 - BPSK 1Mbps/Volume Scan (18x26x7): Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 22.831 V/m
Peak SAR (extrapolated) = 2.21 W/kg
SAR(1 g) = 1.03 W/kg
SAR(10 g) = 0.504 W/kg
Power Drift = 0.06 dB
Total Absorbed Power = 0.0199 W
Maximum value of SAR (measured) = 1.37 W/kg



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Plot #6 – EXPANDED VOLUME SCAN

Date/Time: 2014-02-04 13:00:17

DASY Configuration for 4-slot GPRS850 - Left/Cheek - High/Volume Scan:
Test Laboratory: TCC Nokia
Type: RM-976; Serial: 004402/47/596097/1
Communication System: 4-slot GPRS850; Frequency: 848.8 MHz; Duty Cycle: 1:2.09991; PMF: 1.44911
Medium: HSL835 Medium parameters used: f = 849 MHz; σ = 0.906 S/m; ε_r = 40.929; ρ = 1000 kg/m^3
Phantom section: Left Section

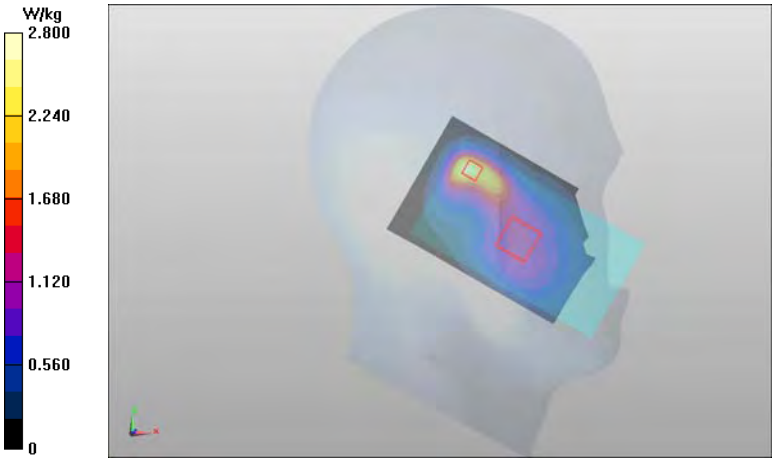
Probe: ES3DV3 - SN3194; ConvF(6.12, 6.12, 6.12); Calibrated: 2013-11-14;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn538; Calibrated: 2013-11-19
Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1179
Measurement SW: DASY52, Version 52.8 (5)

Date/Time: 2014-02-04 09:46:02

DASY Configuration for WLA2450 b-mode - Left/Cheek - Channel 11 - BPSK 1Mbps/Volume Scan:
Test Laboratory: TCC Nokia
Type: RM-976; Serial: 004402/47/596099/7
Communication System: WLAN2450; Frequency: 2462 MHz; Duty Cycle: 1:1; PMF: 1
Medium: HSL2450 Medium parameters used: f = 2462 MHz; σ = 1.823 S/m; ε_r = 38.447; ρ = 1000 kg/m^3
Phantom section: Left Section

Probe: EX3DV4 - SN3960; ConvF(7.39, 7.39, 7.39); Calibrated: 2013-12-10;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1302; Calibrated: 2013-11-08
Phantom: #4 SAM, SAR4 ; Type: QD000P40CD
Measurement SW: DASY52, Version 52.8 (6)

Multi Band Result:
SAR(1 g) = 1.36 W/kg; SAR(10 g) = 0.747 W/kg
Maximum value of SAR (interpolated) = 2.80 W/kg



Note: 4-slot GPRS850 result was scaled by a factor of 1.10 and WLAN2450 result was scaled by a factor of 1.26 before combining.

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Plot #7

Date/Time: 2014-01-31 10:19:54

DASY Configuration for 4-slot GPRS850 - Left/Cheek - High - Repeated/Area Scan:
Test Laboratory: TCC Nokia
Type: RM-976; Serial: 004402/47/596097/1
Communication System: 4-slot GPRS850; Frequency: 848.8 MHz; Duty Cycle: 1:2.09991; PMF: 1.44911
Medium: HSL835 Medium parameters used: f = 849 MHz; σ = 0.897 S/m; ε_r = 40.074; ρ = 1000 kg/m^3
Phantom section: Left Section

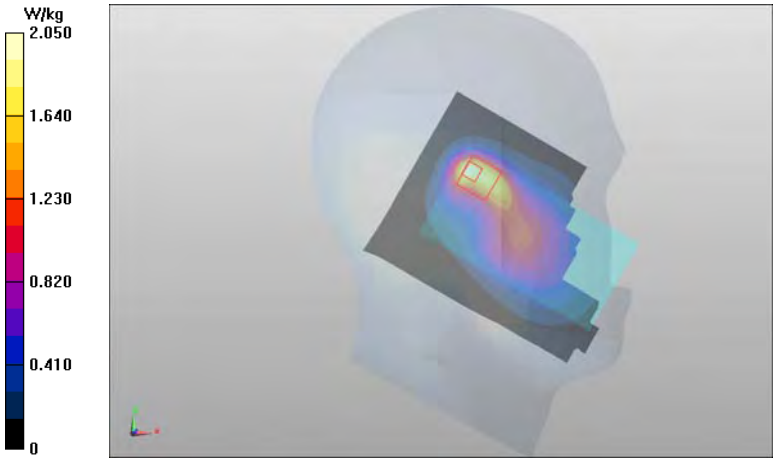
Probe: ES3DV3 - SN3194; ConvF(6.12, 6.12, 6.12); Calibrated: 2013-11-14;
Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used))
Electronics: DAE4 Sn538; Calibrated: 2013-11-19
Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1179
Measurement SW: DASY52, Version 52.8 (5)

Date/Time: 2014-01-27 10:08:25

DASY Configuration for WLAN2450 b-mode - Left/Cheek - Channel 11 - BPSK 1 Mbps/Area Scan:
Test Laboratory: TCC Nokia
Type: RM-976; Serial: 004402/47/596099/7
Communication System: WLAN2450; Frequency: 2462 MHz; Duty Cycle: 1:1; PMF: 1
Medium: HSL2450 Medium parameters used: f = 2462 MHz; σ = 1.81 S/m; ε_r = 38.585; ρ = 1000 kg/m^3
Phantom section: Left Section

Probe: EX3DV4 - SN3960; ConvF(7.39, 7.39, 7.39); Calibrated: 2013-12-10;
Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used))
Electronics: DAE4 Sn1302; Calibrated: 2013-11-08
Phantom: #4 SAM, SAR4 ; Type: QD000P40CD
Measurement SW: DASY52, Version 52.8 (6)

Fast SAR of Combined Scans: SAR(1 g) = 1.52 W/kg; SAR(10 g) = 0.781 W/kg
Maximum value of SAR (interpolated) = 2.05 W/kg



Note: 4-slot GPRS850 result was scaled by a factor of 1.10 and WLAN2450 result was scaled by a factor of 1.26 before combining.

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Plot #8

Date/Time: 2014-03-04 12:51:28

DASY Configuration for 4-slot GPRS1900 - Left/Cheek - High/Area Scan:
Test Laboratory: TCC Nokia
Type: RM-976; Serial: 004402/47/729490/8
Communication System: 4-slot GPRS1900; Frequency: 1909.8 MHz; Duty Cycle: 1:2.09991; PMF: 1.44911
Medium: HSL1900 Medium parameters used: f = 1910 MHz; σ = 1.386 S/m; ε_r = 38.92; ρ = 1000 kg/m³
Phantom section: Left Section

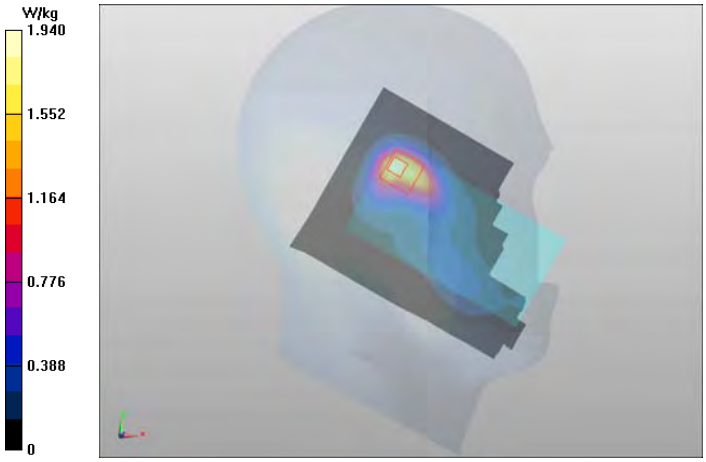
Probe: ES3DV3 - SN3131; ConvF(4.98, 4.98, 4.98); Calibrated: 2013-06-18;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn793; Calibrated: 2013-06-10
Phantom: SAM 1; Type: Twin SAM 040 CA; Serial: TP-1449
Measurement SW: DASY52, Version 52.8 (6)

Date/Time: 2014-01-27 10:08:25

DASY Configuration for WLAN2450 b-mode - Left/Cheek - Channel 11 - BPSK 1 Mbps/Area Scan:
Test Laboratory: TCC Nokia
Type: RM-976; Serial: 004402/47/596099/7
Communication System: WLAN2450; Frequency: 2462 MHz; Duty Cycle: 1:1; PMF: 1
Medium: HSL2450 Medium parameters used: f = 2462 MHz; σ = 1.81 S/m; ε_r = 38.585; ρ = 1000 kg/m³
Phantom section: Left Section

Probe: EX3DV4 - SN3960; ConvF(7.39, 7.39, 7.39); Calibrated: 2013-12-10;
Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used))
Electronics: DAE4 Sn1302; Calibrated: 2013-11-08
Phantom: #4 SAM, SAR4 ; Type: QD000P40CD;
Measurement SW: DASY52, Version 52.8 (6)

Fast SAR of Combined Scans: SAR(1 g) = 1.41 W/kg; SAR(10 g) = 0.667 W/kg
Maximum value of SAR (interpolated) = 1.94 W/kg



Note: 4-slot GPRS1900 result was scaled by a factor of 1.12 and WLAN2450 result was scaled by a factor of 1.26 before combining.

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Plot #9

Date/Time: 2014-01-28 09:19:27

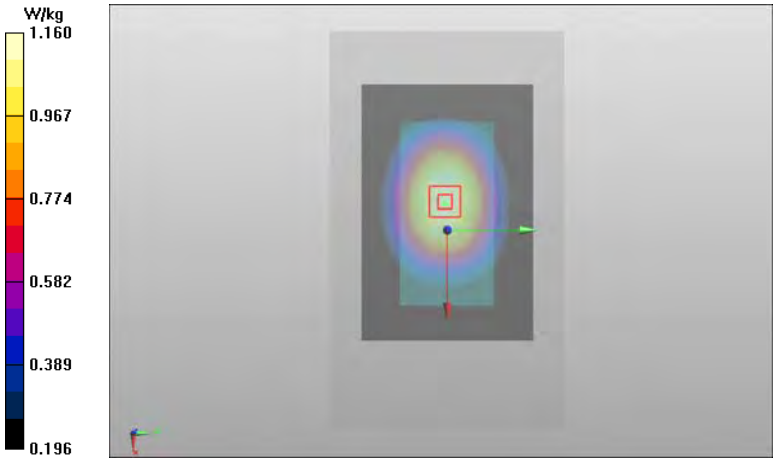
Test Laboratory: TCC Nokia
Type: RM-976; Serial: 004402/47/596097/1

Communication System: 4-slot GPRS850
Frequency: 848.8 MHz; Duty Cycle: 1:2.09991
Medium: BSL835; Medium Notes: t= 21.8 C
Medium parameters used: f = 849 MHz; σ = 0.986 S/m; ε_r = 54.266; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY Configuration:
- Probe: ES3DV3 - SN3194
- ConvF(6.05, 6.05, 6.05); Calibrated: 2013-11-14;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn538; Calibrated: 2013-11-19
- Phantom: SAM 3 Triple Phantom 5.1C; Type: QD 000 P51 CA;
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.9 (7117)

4-slot GPRS850/Body - High - Spacer 15mm - No Headset - Back Facing Phantom/Area Scan (81x121x1):
Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 35.738 V/m
Fast SAR: SAR(1 g) = 1.09 W/kg
Fast SAR(10 g) = 0.776 W/kg
Maximum value of SAR (interpolated) = 1.22 W/kg

4-slot GPRS850/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 = 36.093 V/m
Peak SAR (extrapolated) = 1.35 W/kg
SAR(1 g) = 1.1 W/kg
SAR(10 g) = 0.835 W/kg
Power Drift = -0.02 dB
Maximum value of SAR (measured) = 1.16 W/kg



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Plot #10

Date/Time: 2014-03-03 15:01:17

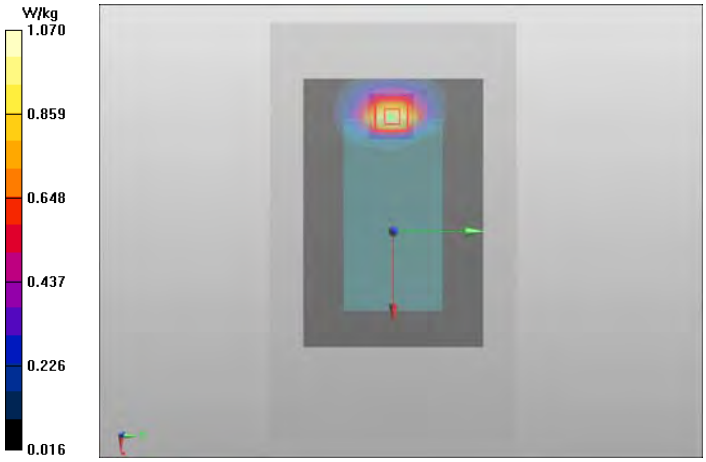
Test Laboratory: TCC Nokia
Type: RM-976; Serial: 004402/47/729490/8

Communication System: 4-slot GPRS1900
Frequency: 1909.8 MHz; Duty Cycle: 1:2.09991
Medium: BSL 1900; Medium Notes: t= 21,2 C
Medium parameters used: f = 1910 MHz; σ = 1.513 S/m; ε_r = 51.239; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY Configuration:
- Probe: ES3DV3 - SN3131
- ConvF(4.62, 4.62, 4.62); Calibrated: 2013-06-18;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn793; Calibrated: 2013-06-10
- Phantom: SAM 3 Triple Phantom 5.1C; Type: QD 000 P51 CA;
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

4-slot GPRS1900/Body - High - Spacer 15mm - WH-108 - Back Facing Phantom/Area Scan (81x121x1):
Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 27.966 V/m
Fast SAR: SAR(1 g) = 0.942 W/kg
Fast SAR(10 g) = 0.487 W/kg
Maximum value of SAR (interpolated) = 1.26 W/kg

4-slot GPRS1900/Body - High - Spacer 15mm - WH-108 - Back Facing Phantom/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 27.974 V/m
Peak SAR (extrapolated) = 1.51 W/kg
SAR(1 g) = 0.956 W/kg
SAR(10 g) = 0.535 W/kg
Power Drift = 0.02 dB
Maximum value of SAR (measured) = 1.07 W/kg



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Plot #11

Date/Time: 2014-01-29 09:28:11

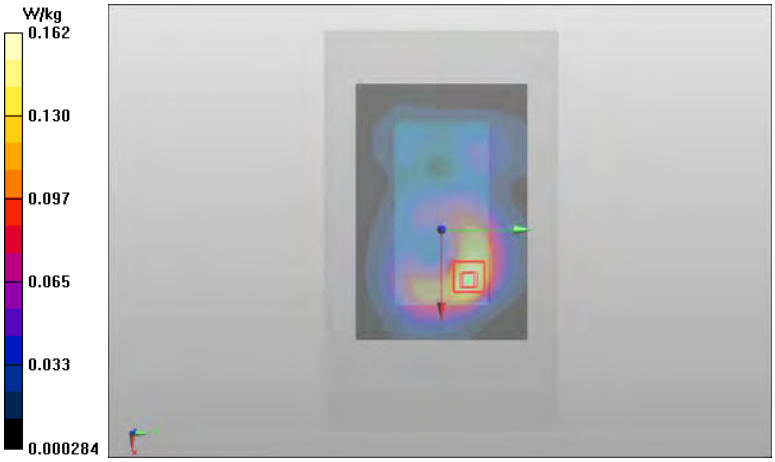
Test Laboratory: TCC Nokia
Type: RM-976; Serial: 004402/47/596099/7

Communication System: WLAN2450
Frequency: 2462 MHz; Duty Cycle: 1:1
Medium: BSL2450; Medium Notes: t= 21.4 C
Medium parameters used: f = 2462 MHz; σ = 1.96 S/m; ε_r = 51.48; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY Configuration:
- Probe: EX3DV4 - SN3960
- ConvF(7.44, 7.44, 7.44); Calibrated: 2013-12-10;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1302; Calibrated: 2013-11-08
- Phantom: #2 Triple, SAR4; Type: QD 000 P51 CA;
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

WLAN2450 b-mode/Body - Channel 11 - BPSK 1 Mbps - Spacer 15mm - No Headset - Back Facing Phantom/Area Scan (121x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 9.096 V/m
Fast SAR: SAR(1 g) = 0.131 W/kg
Fast SAR(10 g) = 0.067 W/kg
Maximum value of SAR (interpolated) = 0.170 W/kg

WLAN2450 b-mode/Body - Channel 11 - BPSK 1 Mbps - Spacer 15mm - No Headset - Back Facing Phantom/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.096 V/m
Peak SAR (extrapolated) = 0.244 W/kg
SAR(1 g) = 0.130 W/kg
SAR(10 g) = 0.071 W/kg
Power Drift = 0.12 dB
Maximum value of SAR (measured) = 0.162 W/kg



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Plot #12

Date/Time: 2014-02-03 09:41:31

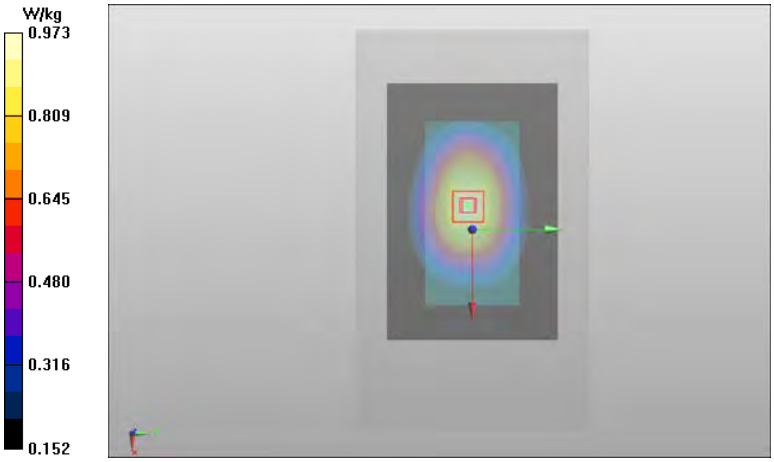
Test Laboratory: TCC Nokia
Type: RM-976; Serial: 004402/47/596221/7

Communication System: 4-slot GPRS850
Frequency: 848.8 MHz; Duty Cycle: 1:2.09991
Medium: BSL835; Medium Notes: t= 21.7 C
Medium parameters used: f = 849 MHz; σ = 0.986 S/m; ε_r = 53.944; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY Configuration:
- Probe: ES3DV3 - SN3194
- ConvF(6.05, 6.05, 6.05); Calibrated: 2013-11-14;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn538; Calibrated: 2013-11-19
- Phantom: SAM 3 Triple Phantom 5.1C; Type: QD 000 P51 CA;
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.9 (7117)

4-slot GPRS850/Body - High - Spacer 10mm - No Headset - Back Facing Phantom/Area Scan (81x121x1):
Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 31.737 V/m
Fast SAR:(1 g) = 0.839 W/kg
Fast SAR(10 g) = 0.600 W/kg
Maximum value of SAR (interpolated) = 0.942 W/kg

4-slot GPRS850/Body - High - Spacer 10mm - No Headset - Back Facing Phantom/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 31.737 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.09 W/kg
SAR(1 g) = 0.883 W/kg
SAR(10 g) = 0.670 W/kg
Power Drift = -0.01 dB
Maximum value of SAR (measured) = 0.973 W/kg



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Plot #13

Date/Time: 2014-03-03 16:09:39

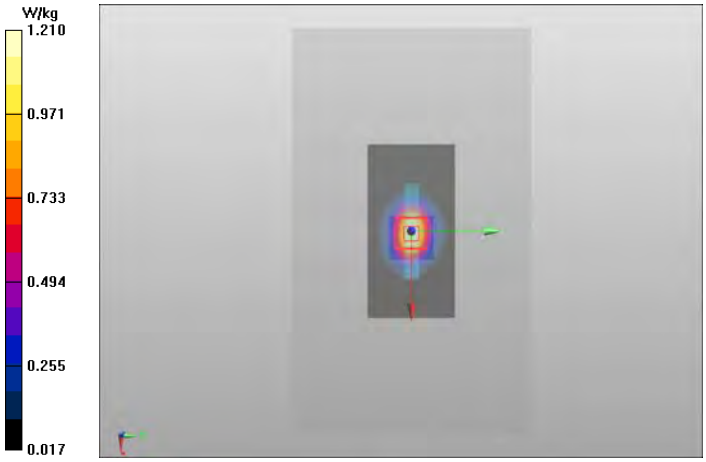
Test Laboratory: TCC Nokia
Type: RM-976; Serial: 004402/47/729495/7

Communication System: 2-slot GPRS1900
Frequency: 1909.8 MHz; Duty Cycle: 1:4.19952
Medium: BSL 1900; Medium Notes: t= 21,2 C
Medium parameters used: f = 1910 MHz; σ = 1.513 S/m; ε_r = 51.239; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY Configuration:
- Probe: ES3DV3 - SN3131
- ConvF(4.62, 4.62, 4.62); Calibrated: 2013-06-18;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn793; Calibrated: 2013-06-10
- Phantom: SAM 3 Triple Phantom 5.1C; Type: QD 000 P51 CA;
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

2-slot GPRS1900/Body - High- Spacer 10mm - No Headset - Bottom Edge Facing Phantom/Area Scan (41x81x1):
Interpolated grid: dx=1.500 mm, dy=1.500 mm
Reference Value = 29.951 V/m
Fast SAR: SAR(1 g) = 0.990 W/kg
Fast SAR(10 g) = 0.494 W/kg
Maximum value of SAR (interpolated) = 1.26 W/kg

2-slot GPRS1900/Body - High- Spacer 10mm - No Headset - Bottom Edge Facing Phantom/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 30.077 V/m
Peak SAR (extrapolated) = 1.61 W/kg
SAR(1 g) = 0.996 W/kg
SAR(10 g) = 0.530 W/kg
Power Drift = -0.01 dB
Maximum value of SAR (measured) = 1.21 W/kg



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Plot #14

Date/Time: 2014-01-30 10:17:11

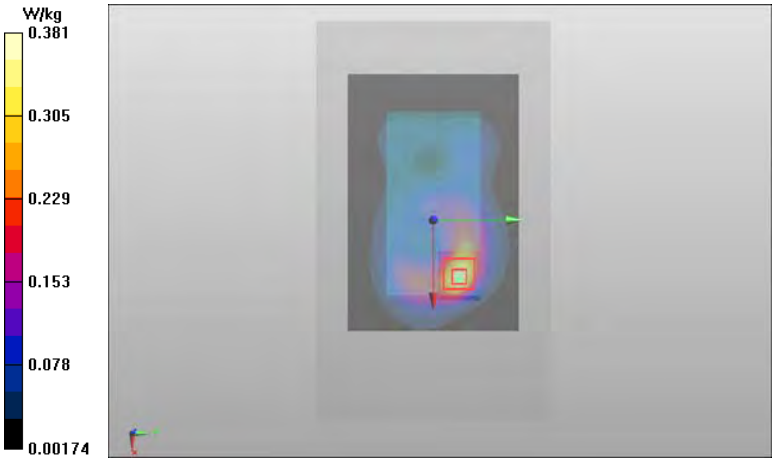
Test Laboratory: TCC Nokia
Type: RM-976; Serial: 004402/47/596099/7

Communication System: WLAN2450
Frequency: 2457 MHz; Duty Cycle: 1:1
Medium: BSL2450; Medium Notes: t= 21.3 C
Medium parameters used: f = 2457 MHz; σ = 1.944 S/m; ε_r = 51.265; ρ = 1000 kg/m^3
Phantom section: Center Section

DASY Configuration:
- Probe: EX3DV4 - SN3960
- ConvF(7.44, 7.44, 7.44); Calibrated: 2013-12-10;
- Sensor-Surface: 3mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1302; Calibrated: 2013-11-08
- Phantom: #2 Triple, SAR4; Type: QD 000 P51 CA;
- Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.9 (7117)

WLAN2450 b-mode/Body - Channel 10 - QPSK 5.5 Mbps - Spacer 10mm - No Headset - Back Facing Phantom/Area Scan (121x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 13.722 V/m
Fast SAR: SAR(1 g) = 0.284 W/kg
Fast SAR(10 g) = 0.138 W/kg
Maximum value of SAR (interpolated) = 0.373 W/kg

WLAN2450 b-mode/Body - Channel 10 - QPSK 5.5 Mbps - Spacer 10mm - No Headset - Back Facing Phantom/Zoom Scan (7x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.722 V/m
Peak SAR (extrapolated) = 0.591 W/kg
SAR(1 g) = 0.297 W/kg
SAR(10 g) = 0.150 W/kg
Power Drift = -0.03 dB
Maximum value of SAR (measured) = 0.381 W/kg



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APPENDIX C: DIELECTRIC PARAMETERS OF THE TISSUE SIMULANTS

Head tissue simulant dielectric parameters used in the measurements:

f (MHz)	Date	Dielectric Parameters					
		824.2MHz		836.6MHz		848.8MHz	
		εr	σ [S/m]	εr	σ [S/m]	εr	σ [S/m]
GSM/GPRS/ EGPRS850	2014-01-31	40.3	0.88	40.2	0.89	40.1	0.90
	2014-02-04	41.2	0.89	41.0	0.90	40.9	0.90
	2014-03-03	40.7	0.88	40.6	0.89	40.6	0.90
f (MHz)	Date	Dielectric Parameters					
		1850.2MHz		1880.0MHz		1909.8MHz	
		εr	σ [S/m]	εr	σ [S/m]	εr	σ [S/m]
GSM/GPRS/ EGPRS1900	2014-01-29	39.5	1.35	39.4	1.38	39.3	1.40
	2014-03-04	39.1	1.33	39.0	1.36	38.9	1.38
f (MHz)	Date	Dielectric Parameters					
		2412.0MHz		2437.0MHz		2462.0MHz	
		εr	σ [S/m]	εr	σ [S/m]	εr	σ [S/m]
WLAN2450	2014-01-26	38.8	1.75	38.7	1.78	38.6	1.81
	2014-02-04	38.7	1.75	38.5	1.79	38.4	1.82

Body tissue simulant dielectric parameters used in the measurements:

f (MHz)	Date	Dielectric Parameters					
		824.2MHz		836.6MHz		848.8MHz	
		εr	σ [S/m]	εr	σ [S/m]	εr	σ [S/m]
GSM/GPRS/ EGPRS850	2014-01-28	54.4	0.97	54.3	0.98	54.3	0.98
	2014-02-03	54.1	0.97	54.0	0.98	53.9	0.98
	2014-03-04	54.2	0.96	54.2	0.97	54.1	0.98
f (MHz)	Date	Dielectric Parameters					
		1850.2MHz		1880.0MHz		1909.8MHz	
		εr	σ [S/m]	εr	σ [S/m]	εr	σ [S/m]
GSM/GPRS/ EGPRS1900	2014-01-29	52.0	1.47	52.0	1.50	51.9	1.53
	2014-01-30	52.0	1.47	51.9	1.50	51.8	1.53
	2014-03-03	51.4	1.46	51.3	1.48	51.2	1.51
f (MHz)	Date	Dielectric Parameters					
		2412.0MHz		2437.0MHz		2462.0MHz	
		εr	σ [S/m]	εr	σ [S/m]	εr	σ [S/m]
WLAN2450	2014-01-29	51.6	1.89	51.5	1.92	51.5	1.96
	2014-01-30	51.4	1.89	51.3	1.92	51.3	1.95

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APPENDIX D: RELEVANT PAGES FROM PROBE CALIBRATION REPORTS

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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 Salo TCC

Certificate No: ES3-3131_Jun13

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3131
Calibration procedure(s)	QA CAL-01.v8, QA CAL-23.v4, QA CAL-25.v4 Calibration procedure for dosimetric E-field probes
Calibration date:	June 18, 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	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
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-13)	In house check: Apr-15
Network Analyzer HP 8753E	US37390585	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: June 18, 2013

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

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe ES3DV3

SN:3131

Manufactured: February 6, 2007
Calibrated: June 18, 2013

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3131

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.32	1.31	1.26	± 10.1 %
DCP (mV)[B]	101.0	101.8	102.6	

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	167.0	±2.7 %
		Y	0.0	0.0	1.0		164.9	
		Z	0.0	0.0	1.0		163.7	

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: ES3DV3 - SN:3131

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	6.23	6.23	6.23	0.31	1.83	± 12.0 %
835	41.5	0.90	5.96	5.96	5.96	0.26	1.99	± 12.0 %
1750	40.1	1.37	5.17	5.17	5.17	0.49	1.47	± 12.0 %
1900	40.0	1.40	4.98	4.98	4.98	0.67	1.27	± 12.0 %
2450	39.2	1.80	4.33	4.33	4.33	0.80	1.14	± 12.0 %
2600	39.0	1.96	4.21	4.21	4.21	0.80	1.09	± 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: ES3DV3 - SN:3131

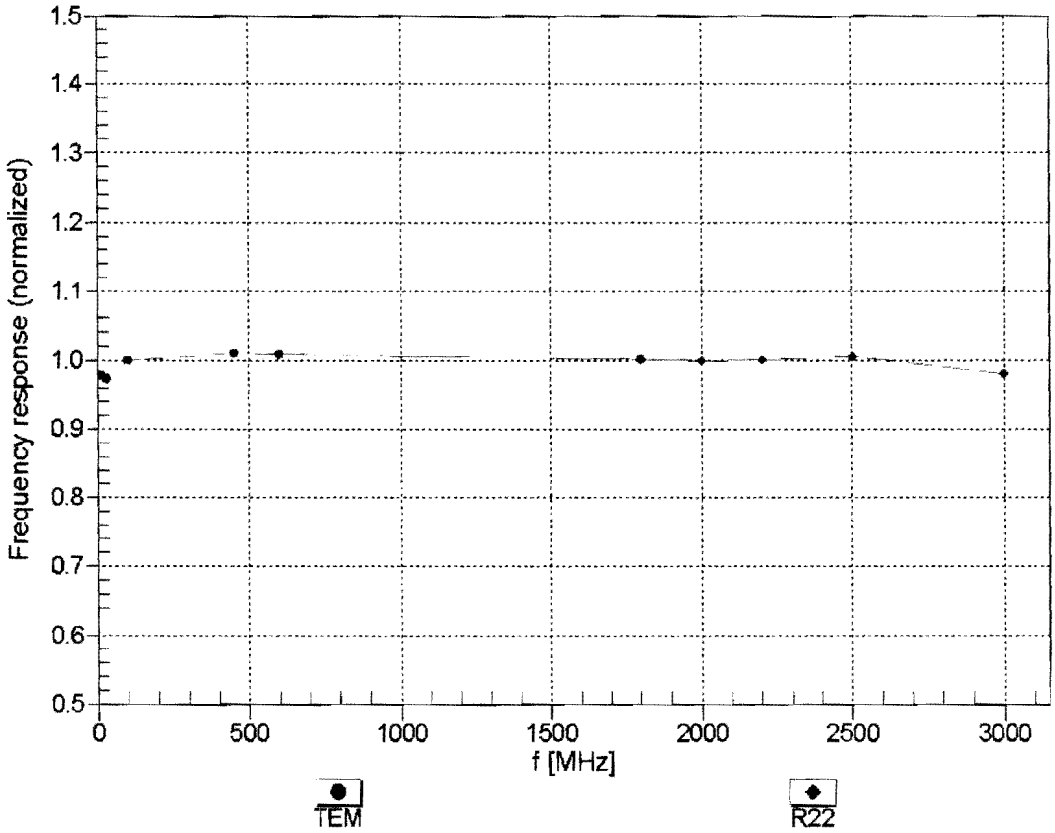
Calibration Parameter Determined in Body Tissue Simulating Media

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	6.10	6.10	6.10	0.30	1.90	± 12.0 %
835	55.2	0.97	6.03	6.03	6.03	0.39	1.68	± 12.0 %
1750	53.4	1.49	4.87	4.87	4.87	0.31	2.53	± 12.0 %
1900	53.3	1.52	4.62	4.62	4.62	0.28	2.70	± 12.0 %
2450	52.7	1.95	4.27	4.27	4.27	0.68	1.20	± 12.0 %
2600	52.5	2.16	4.17	4.17	4.17	0.50	1.10	± 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

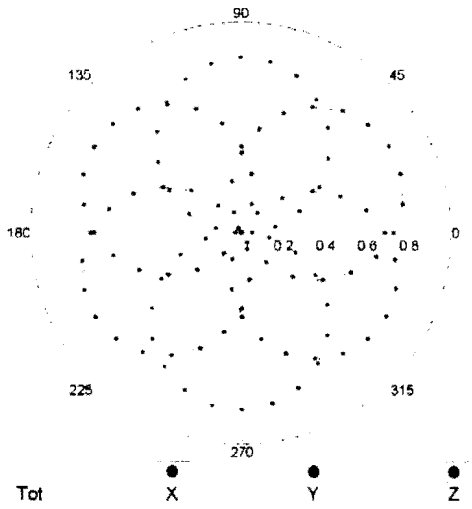
(TEM-Cell:ifi110 EXX, Waveguide: R22)



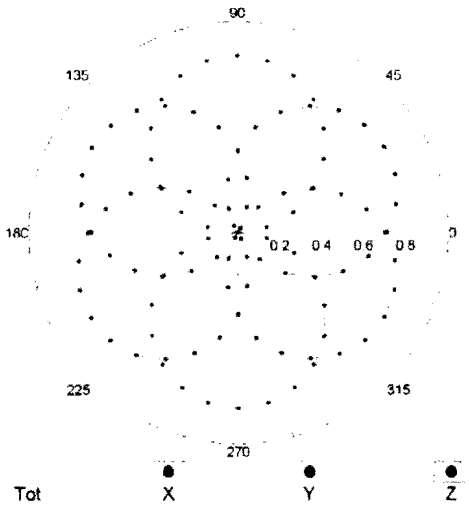
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

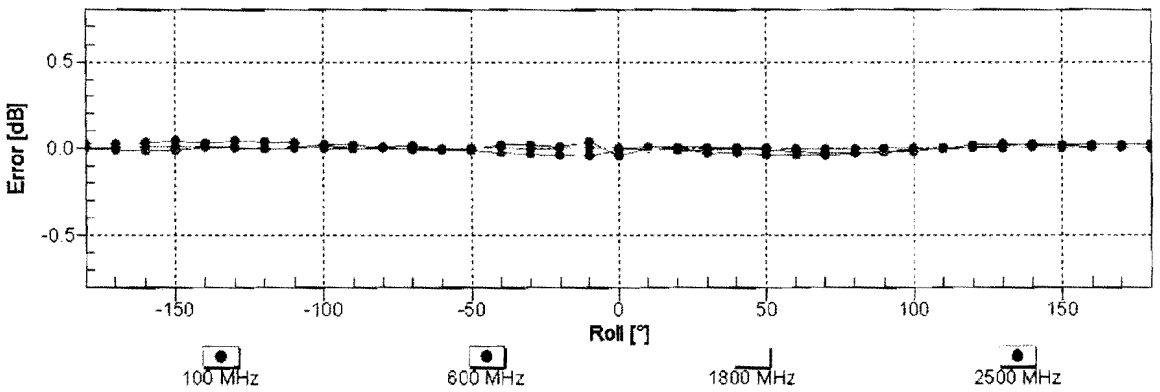
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



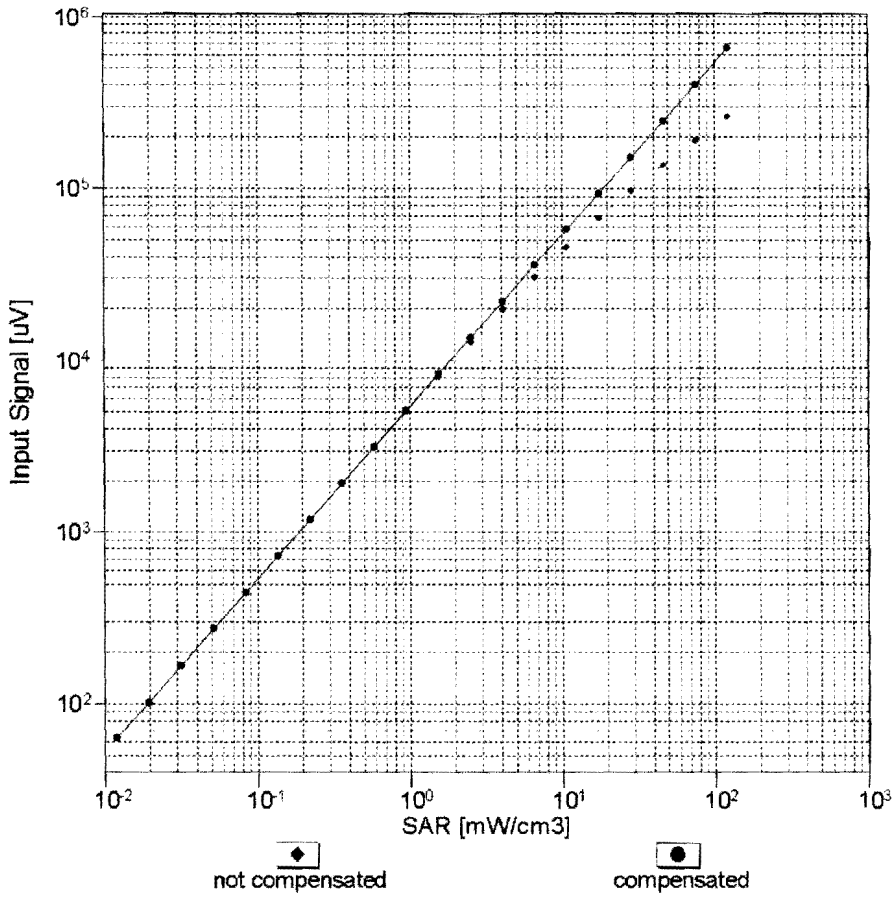
f=1800 MHz,R22

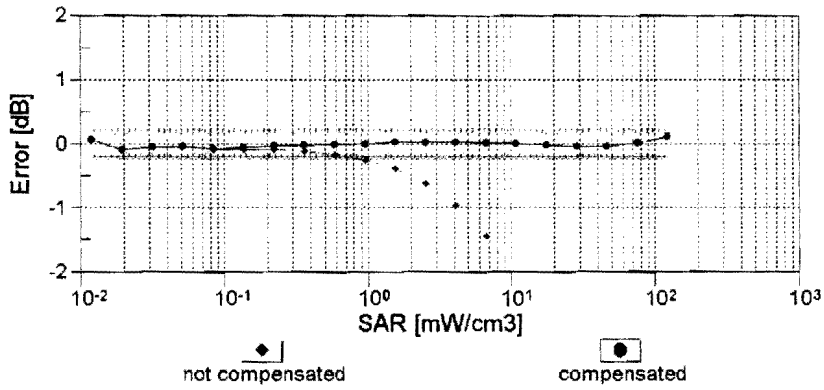




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})
(TEM cell , f = 900 MHz)

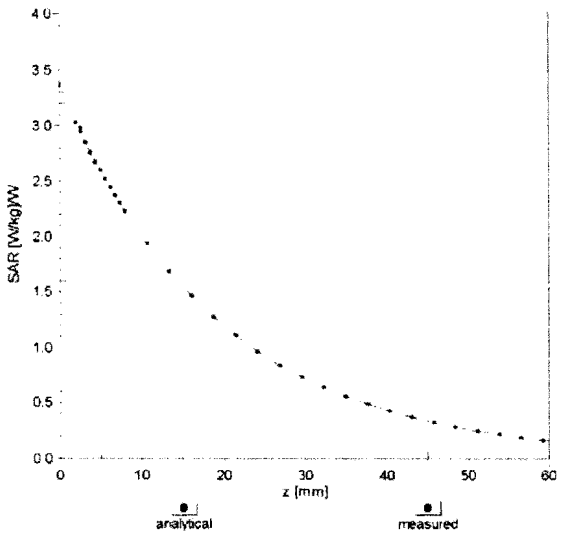




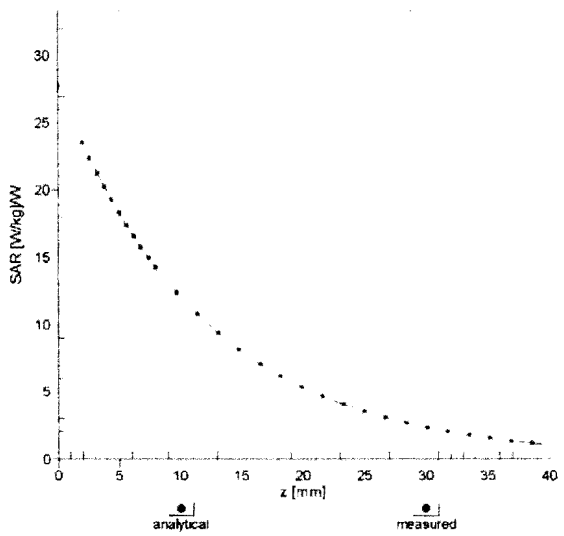
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

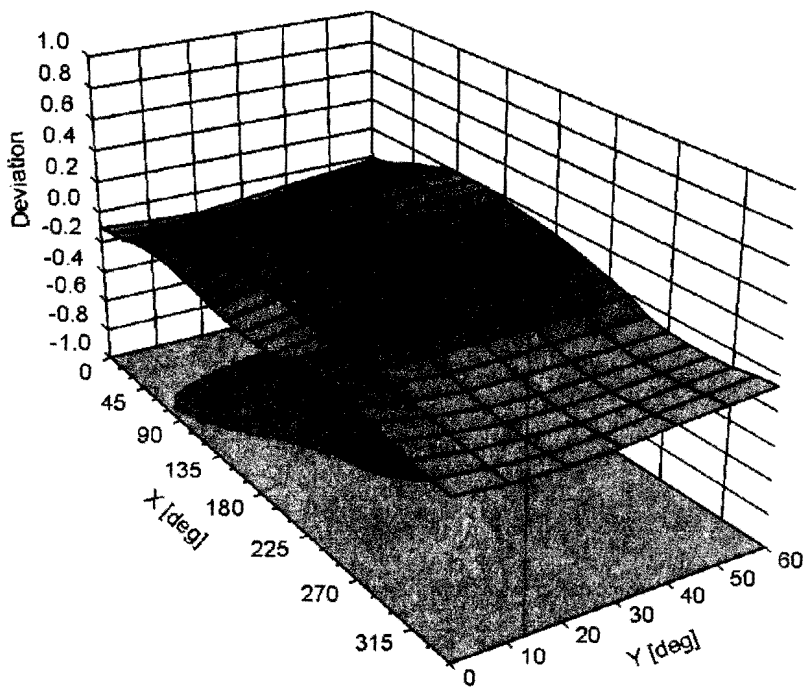


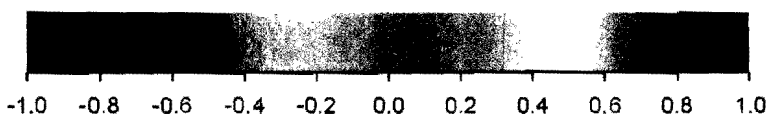
f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3131

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-39.9
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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 Salo TCC**

Certificate No: **ES3-3194_Nov13**

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3194
Calibration procedure(s)	QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	November 14, 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	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	4-Sep-13 (No. DAE4-660_Sep13)	Sep-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-15
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

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

Issued: November 15, 2013

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3194

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 [G]	Depth [G] (mm)	Unct. (k=2)
835	41.5	0.90	6.12	6.12	6.12	0.28	2.07	± 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.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3194

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 [G]	Depth [G] (mm)	Unct. (k=2)
835	55.2	0.97	6.05	6.05	6.05	0.69	1.30	± 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.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

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Accreditation No.: SCS 108

Client **Nokia Salo TCC**

Certificate No: EX3-3960_Dec13

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3960
Calibration procedure(s)	QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	December 10, 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	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	4-Sep-13 (No. DAE4-660_Sep13)	Sep-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-15
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

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

Issued: December 11, 2013

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3960

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 [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	10.78	10.78	10.78	0.47	0.86	± 12.0 %
835	41.5	0.90	10.45	10.45	10.45	0.41	0.86	± 12.0 %
1750	40.1	1.37	8.49	8.49	8.49	0.57	0.67	± 12.0 %
1900	40.0	1.40	8.23	8.23	8.23	0.62	0.64	± 12.0 %
2450	39.2	1.80	7.39	7.39	7.39	0.38	0.83	± 12.0 %
2600	39.0	1.96	7.33	7.33	7.33	0.39	0.84	± 12.0 %
5200	36.0	4.66	5.27	5.27	5.27	0.35	1.80	± 13.1 %
5300	35.9	4.76	5.07	5.07	5.07	0.35	1.80	± 13.1 %
5500	35.6	4.96	4.99	4.99	4.99	0.35	1.80	± 13.1 %
5600	35.5	5.07	4.80	4.80	4.80	0.35	1.80	± 13.1 %
5800	35.3	5.27	4.80	4.80	4.80	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.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3960

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 [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	10.24	10.24	10.24	0.43	0.86	± 12.0 %
835	55.2	0.97	10.08	10.08	10.08	0.34	1.00	± 12.0 %
1750	53.4	1.49	8.33	8.33	8.33	0.52	0.72	± 12.0 %
1900	53.3	1.52	7.88	7.88	7.88	0.62	0.64	± 12.0 %
2450	52.7	1.95	7.44	7.44	7.44	0.62	0.50	± 12.0 %
2600	52.5	2.16	7.14	7.14	7.14	0.59	0.50	± 12.0 %
5200	49.0	5.30	4.60	4.60	4.60	0.45	1.90	± 13.1 %
5300	48.9	5.42	4.33	4.33	4.33	0.50	1.90	± 13.1 %
5500	48.6	5.65	4.12	4.12	4.12	0.50	1.90	± 13.1 %
5600	48.5	5.77	3.97	3.97	3.97	0.50	1.90	± 13.1 %
5800	48.2	6.00	4.14	4.14	4.14	0.55	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.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

APPENDIX E: RELEVANT PAGES FROM DIPOLE VALIDATION KIT REPORTS

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

Accreditation No.: SCS 108

Client **Nokia Salo TCC**

Certificate No: D835V2-480_Dec12

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 480
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	December 03, 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	

Issued: December 3, 2012

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.3
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.4 ± 6 %	0.92 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.40 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.56 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.16 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.5 ± 6 %	0.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.42 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.51 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.59 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.27 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.8 Ω - 3.3 jΩ
Return Loss	- 29.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.7 Ω - 4.9 jΩ
Return Loss	- 24.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.391 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: 03.12.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 480

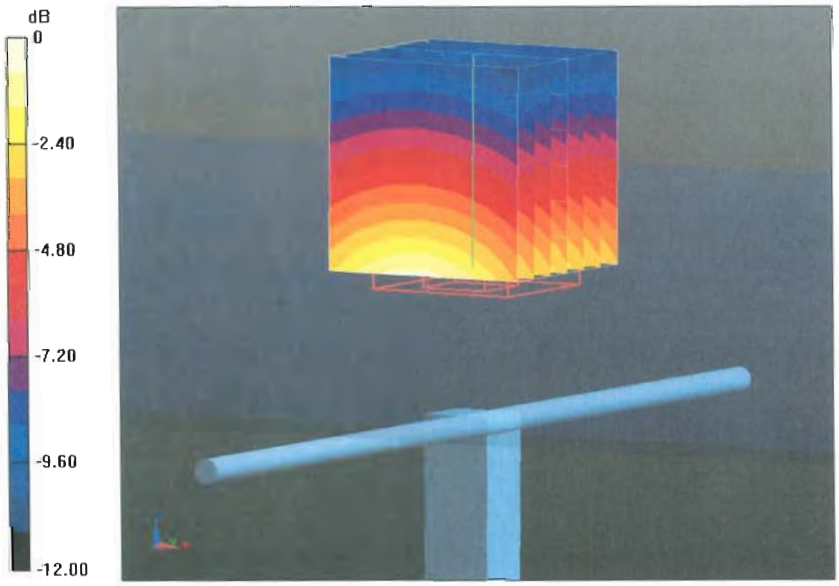
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.92 mho/m; ε_r = 41.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

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: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.3(988); SEMCAD X 14.6.7(6848)

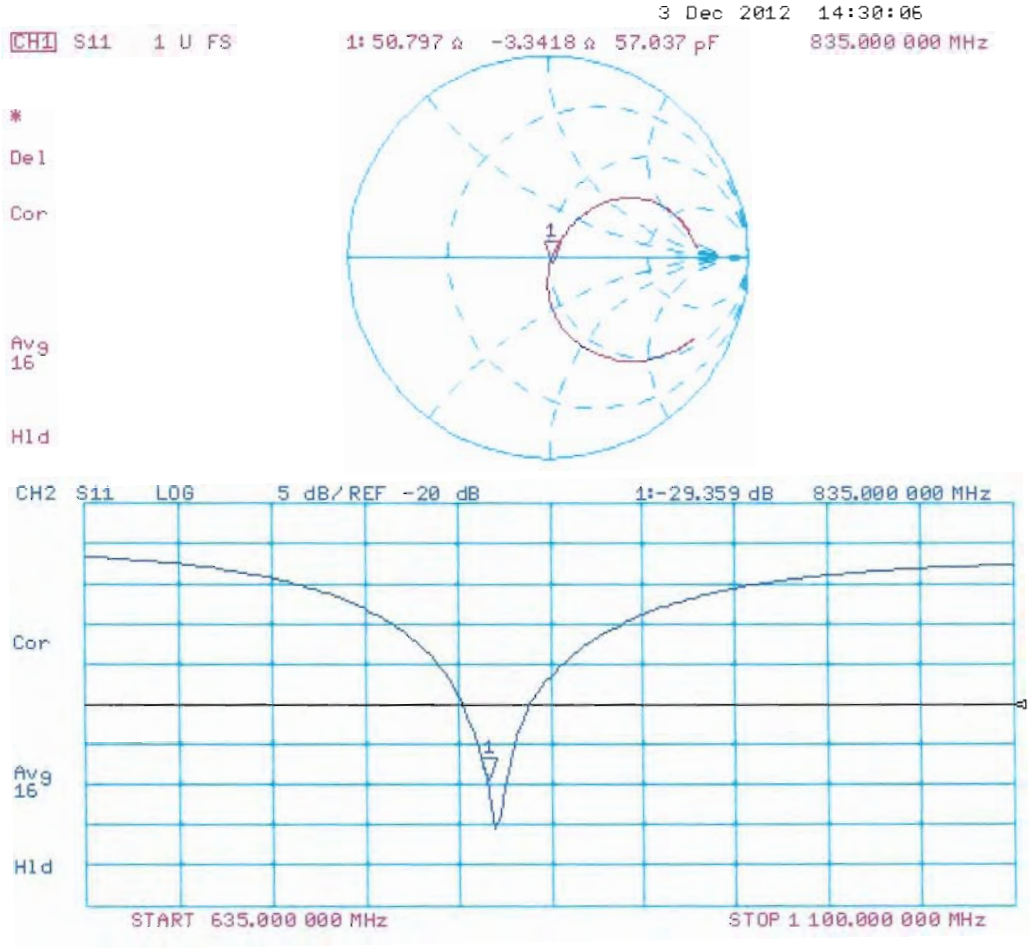
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.814 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.60 W/kg
SAR(1 g) = 2.39 W/kg; SAR(10 g) = 1.56 W/kg
Maximum value of SAR (measured) = 2.80 W/kg



0 dB = 2.80 W/kg = 4.47 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 03.12.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 480

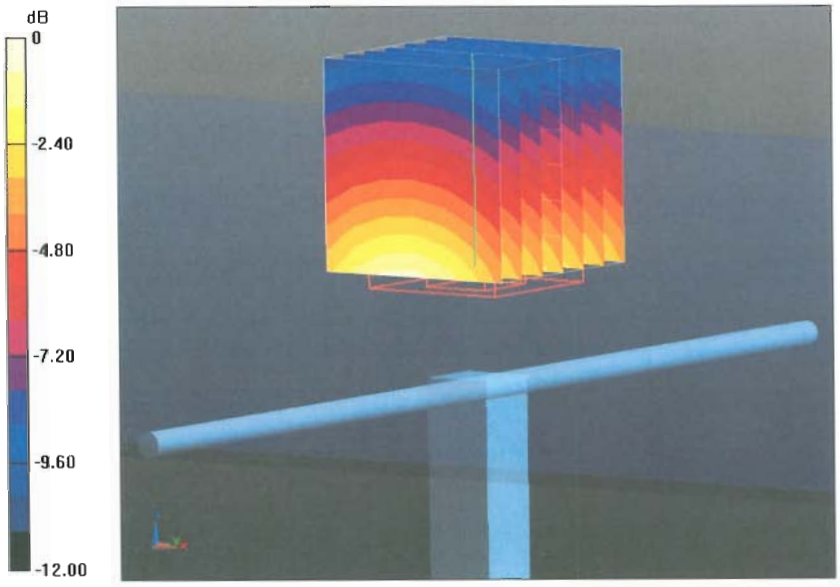
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.99 mho/m; ε_r = 54.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.02, 6.02, 6.02); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.3(988); SEMCAD X 14.6.7(6848)

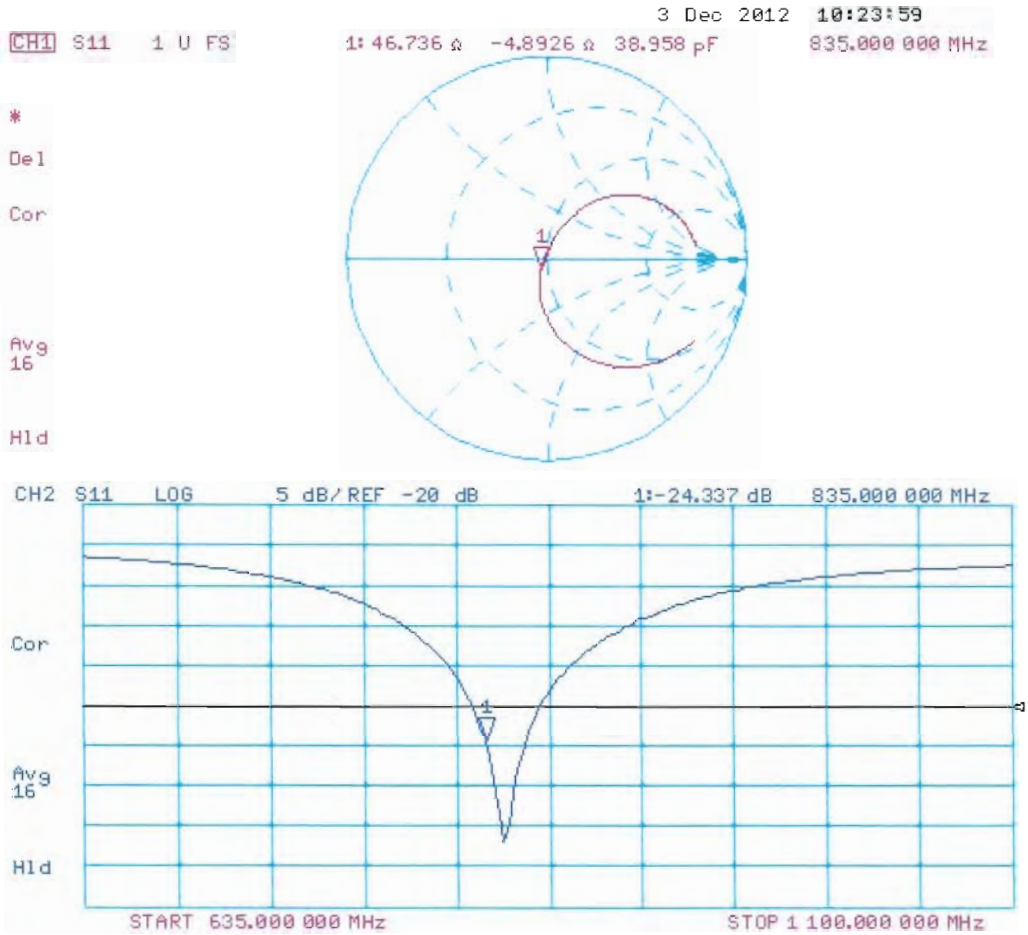
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.301 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.53 W/kg
SAR(1 g) = 2.42 W/kg; SAR(10 g) = 1.59 W/kg
Maximum value of SAR (measured) = 2.80 W/kg



0 dB = 2.80 W/kg = 4.47 dBW/kg

Impedance Measurement Plot for Body TSL



Dipole D835V2 – SN: 480 Antenna Parameters measured: 2014-01-31.

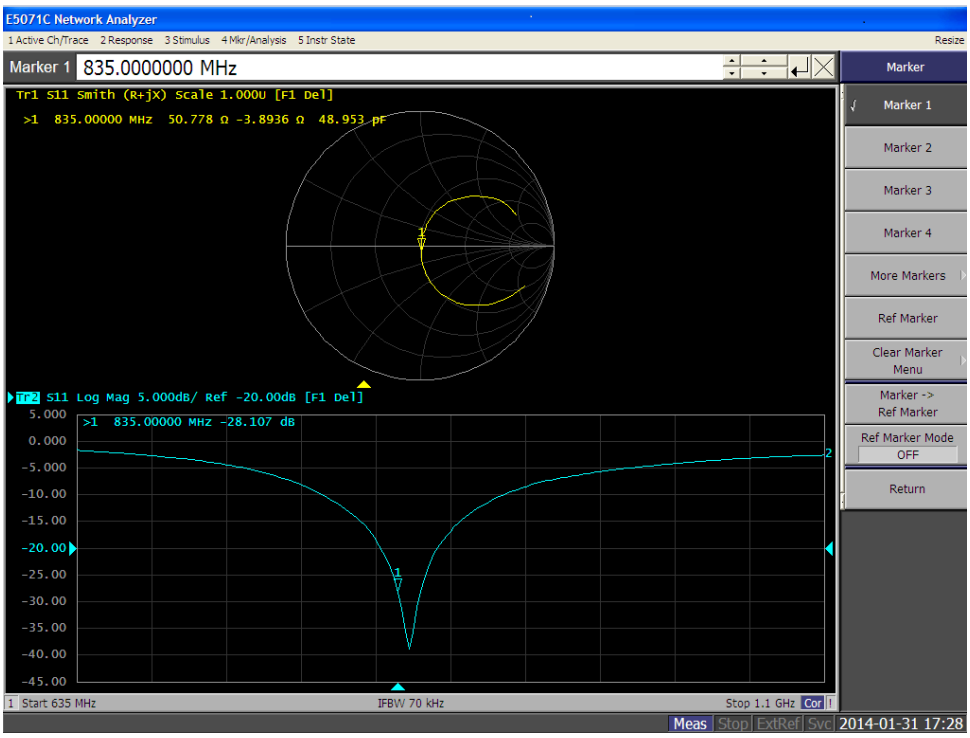
Antenna Parameters with Head TSL

	Calibration certificate	Annual measurement
Impedance, transformed to feed point	50.8 Ω - 3.3 jΩ	50.8 Ω -3.9 jΩ
Return loss	-29.4 dB	-28.1 dB

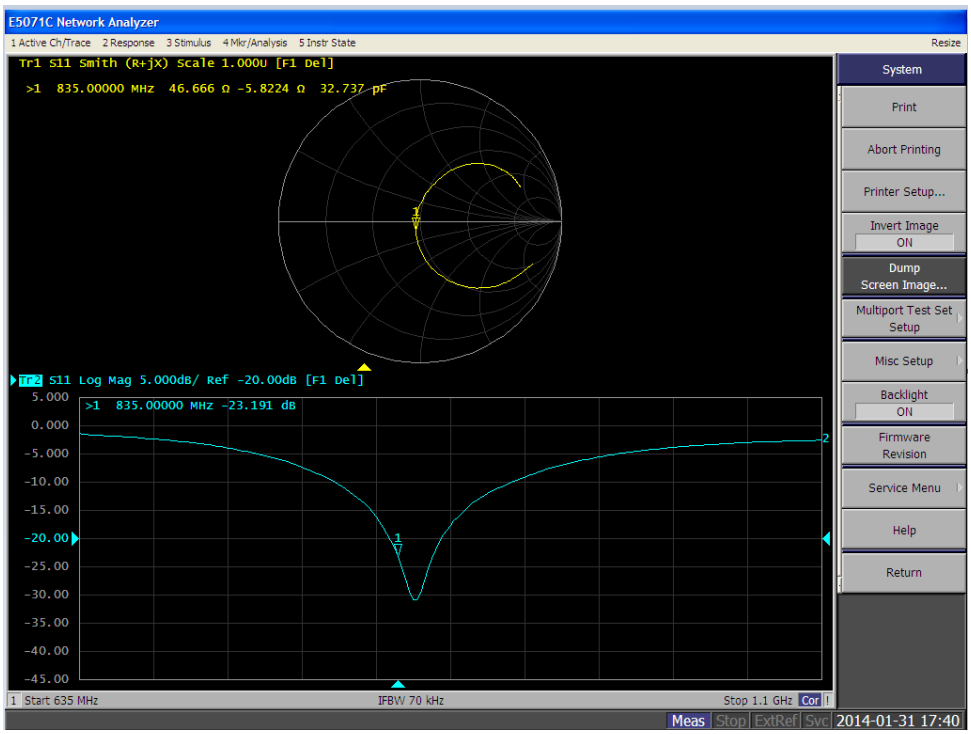
Antenna Parameters with Body TSL

	Calibration certificate	Annual measurement
Impedance, transformed to feed point	47.4 Ω - 3.8 jΩ	46.7 Ω -5.8 jΩ
Return loss	-26.5 dB	-23.2 dB

Impedance Measurement Plot for Head TSL 83



Impedance Measurement Plot for Body TSL 835



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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 Salo TCC**

Certificate No: D1900V2-5d013_Dec12

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d013
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	

Issued: December 6, 2012

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

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.3
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.5 ± 6 %	1.38 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.1 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**40.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.2 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.2 ± 6 %	1.52 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.3 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**41.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.6 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.3 Ω + 6.2 jΩ
Return Loss	- 23.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.4 Ω + 5.9 jΩ
Return Loss	- 24.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.194 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	April 30, 2002

DASY5 Validation Report for Head TSL

Date: 06.12.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d013

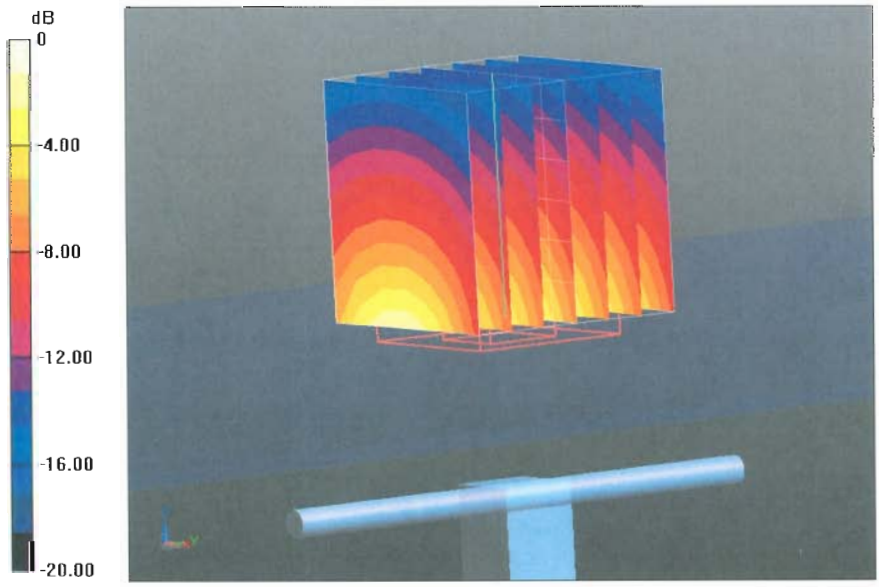
Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.38 mho/m; ε_r = 39.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.01, 5.01, 5.01); Calibrated: 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)

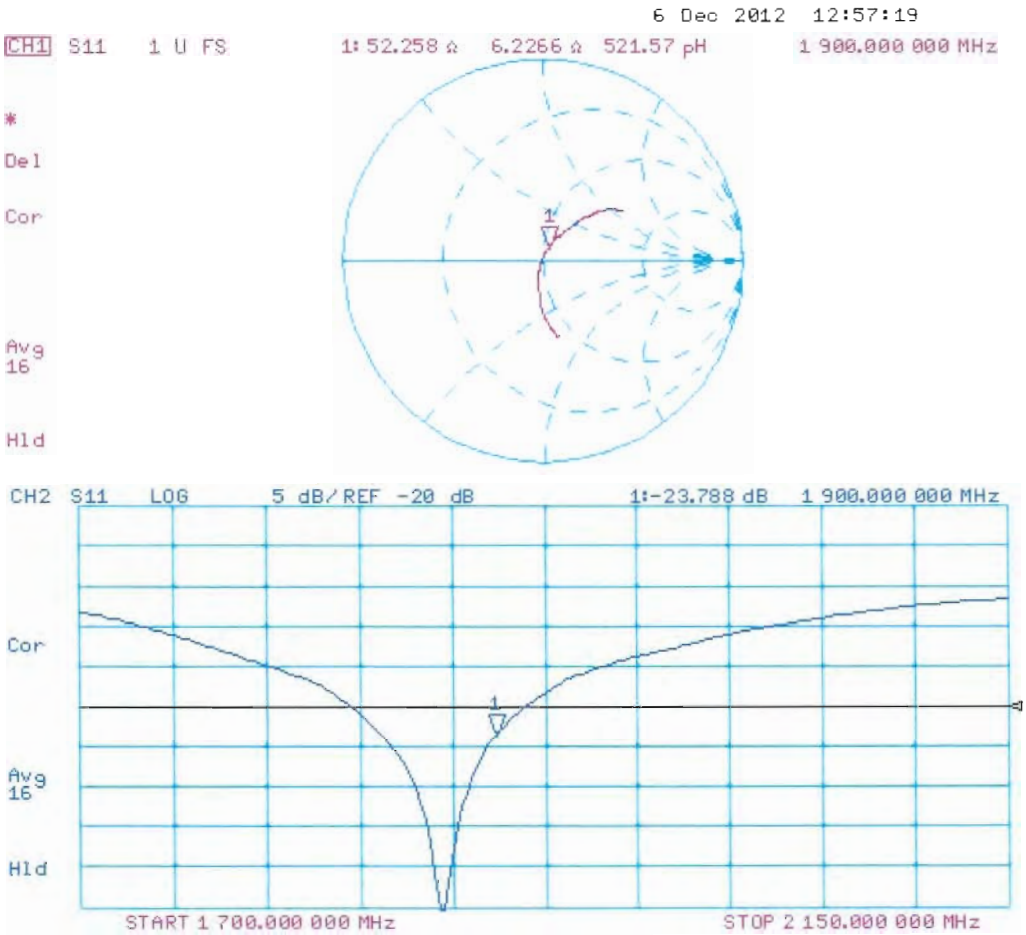
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.748 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 18.0 W/kg
SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.28 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 Head TSL



DASY5 Validation Report for Body TSL

Date: 06.12.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d013

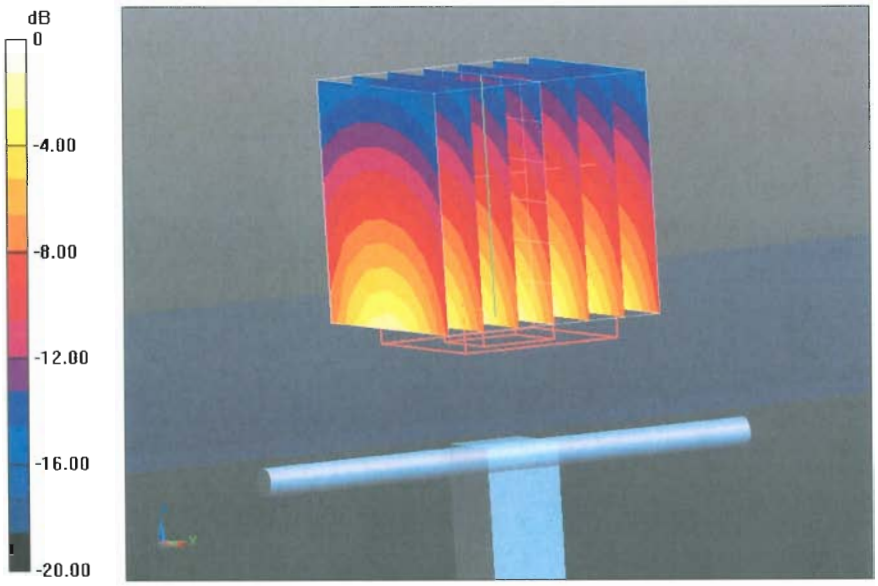
Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.52 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

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)

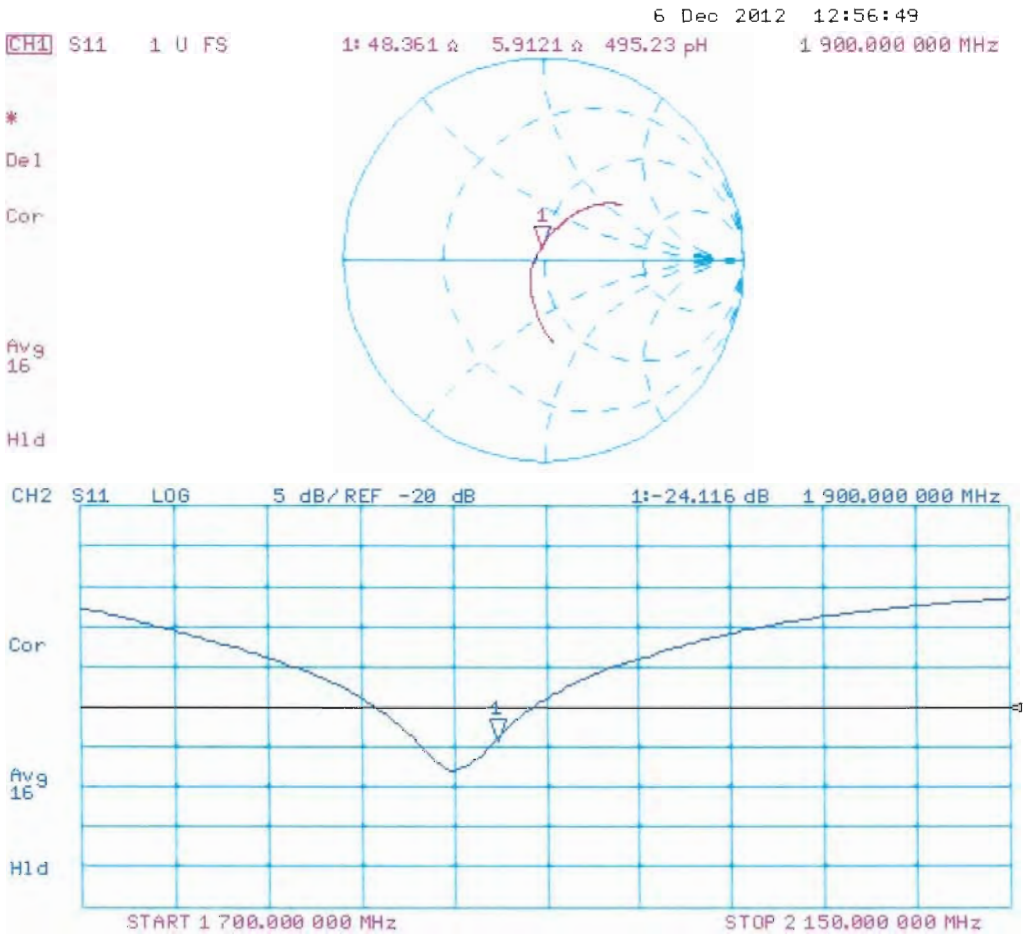
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.039 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 18.0 W/kg
SAR(1 g) = 10.3 W/kg; SAR(10 g) = 5.41 W/kg
Maximum value of SAR (measured) = 12.9 W/kg



0 dB = 12.9 W/kg = 11.11 dBW/kg

Impedance Measurement Plot for Body TSL



Dipole D1900V2 - SN5d013 Antenna Parameters measured: 2014-01-31.

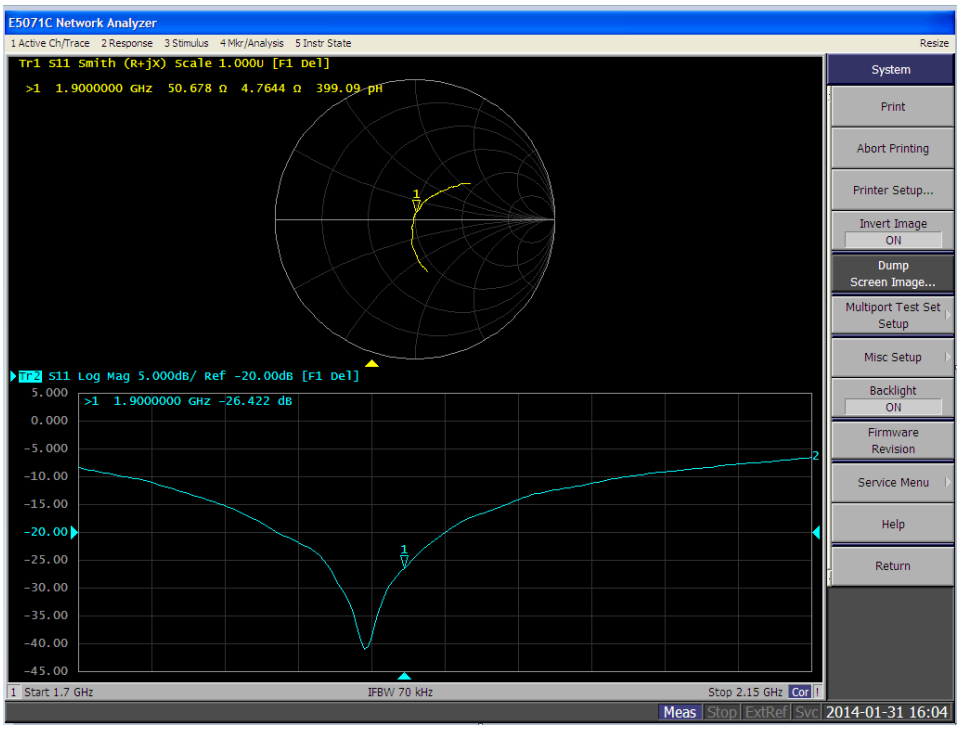
Antenna Parameters with Head TSL

	Calibration certificate	Annual measurement
Impedance, transformed to feed point	52.3 Ω 6.2 jΩ	50.7 Ω 4.8 jΩ
Return loss	-23.8 dB	-26.4 dB

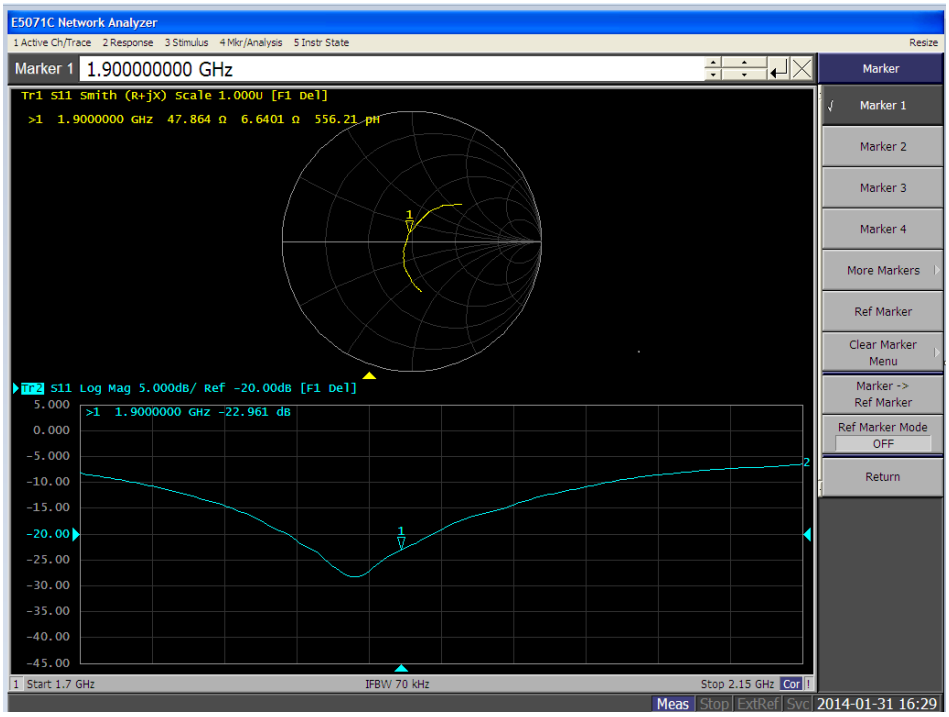
Antenna Parameters with Body TSL

	Calibration certificate	Annual measurement
Impedance, transformed to feed point	48.4 Ω 5.9 jΩ	47.9 Ω 6.6 jΩ
Return loss	-24.1 dB	-23.0 dB

Impedance Measurement Plot for Head TSL 1900



Impedance Measurement Plot for Body TSL 1900



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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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 Salo TCC**

Certificate No: D2450V2-749_Dec12

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 749
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	December 07, 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:	Leif Klysner	Laboratory Technician	
oproved by:	Katja Pokovic	Technical Manager	

Issued: December 7, 2012

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

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

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%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.3
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.2 ± 6 %	1.84 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.7 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**53.9 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**25.2 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	50.7 ± 6 %	2.02 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.2 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**51.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.08 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**24.0 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.6 Ω + 3.4 jΩ
Return Loss	- 27.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.5 Ω + 4.3 jΩ
Return Loss	- 27.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.163 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	December 01, 2003

DASY5 Validation Report for Head TSL

Date: 07.12.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

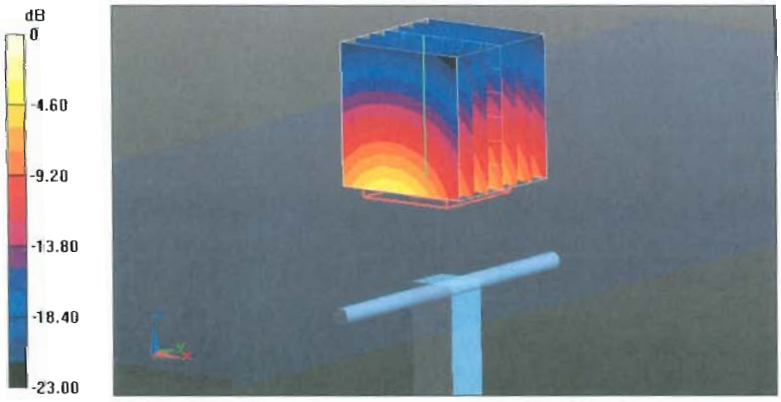
Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.84 mho/m; ε_r = 38.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.45, 4.45, 4.45); 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)

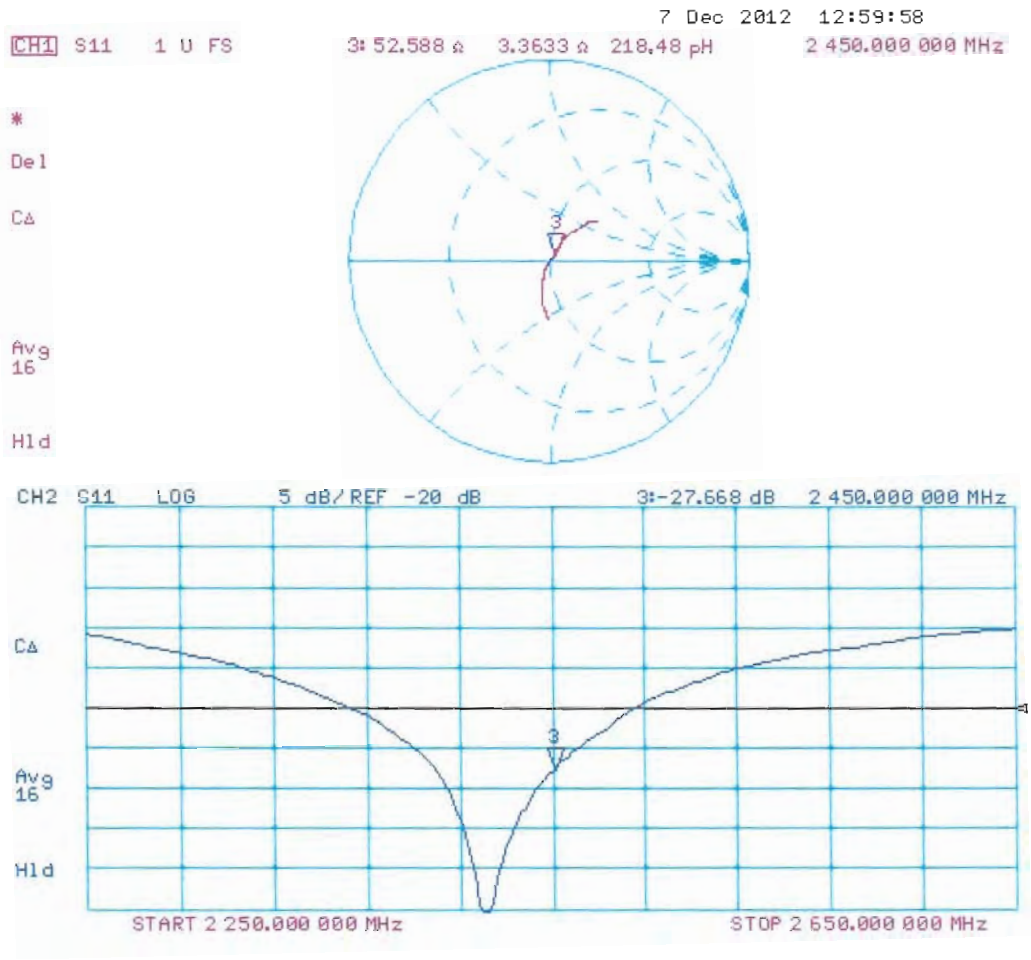
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 99.608 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 28.2 W/kg
SAR(1 g) = 13.7 W/kg; SAR(10 g) = 6.35 W/kg
Maximum value of SAR (measured) = 17.3 W/kg



0 dB = 17.3 W/kg = 12.38 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 07.12.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

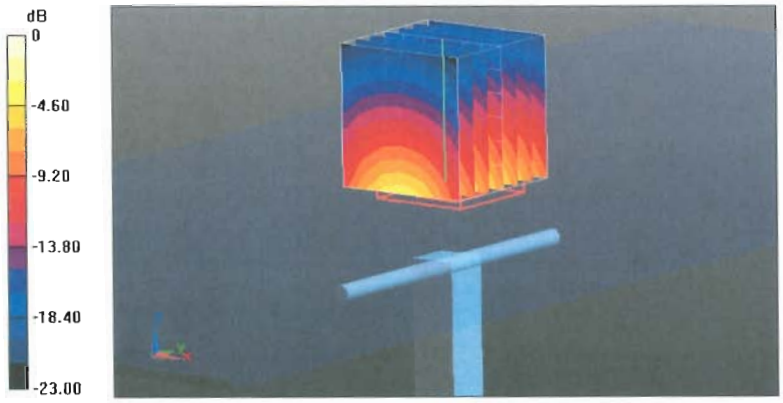
Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.02 mho/m; ε_r = 50.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.26, 4.26, 4.26); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.3(988); SEMCAD X 14.6.7(6848)

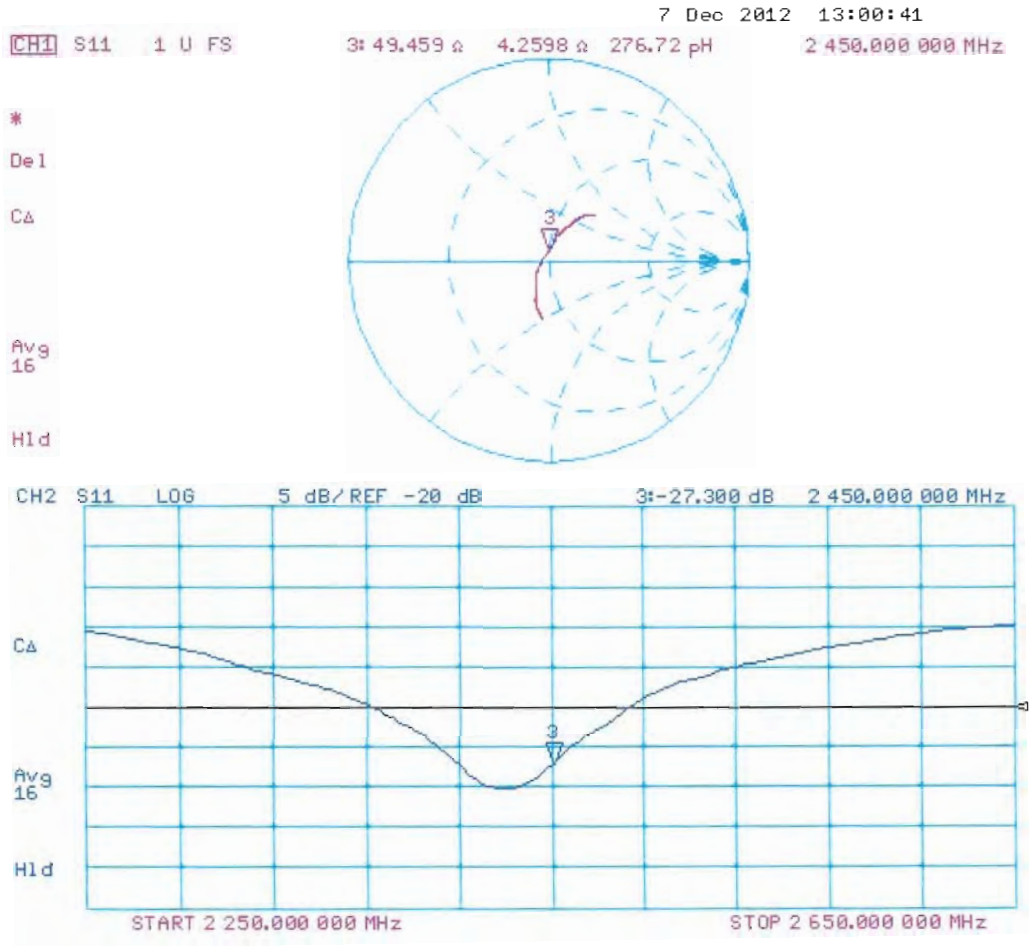
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm 2/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.139 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 27.4 W/kg
SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.08 W/kg
Maximum value of SAR (measured) = 17.4 W/kg



0 dB = 17.4 W/kg = 12.41 dBW/kg

Impedance Measurement Plot for Body TSL



Dipole D2450V2 – SN:749 Antenna Parameters measured: 2014-01-14.

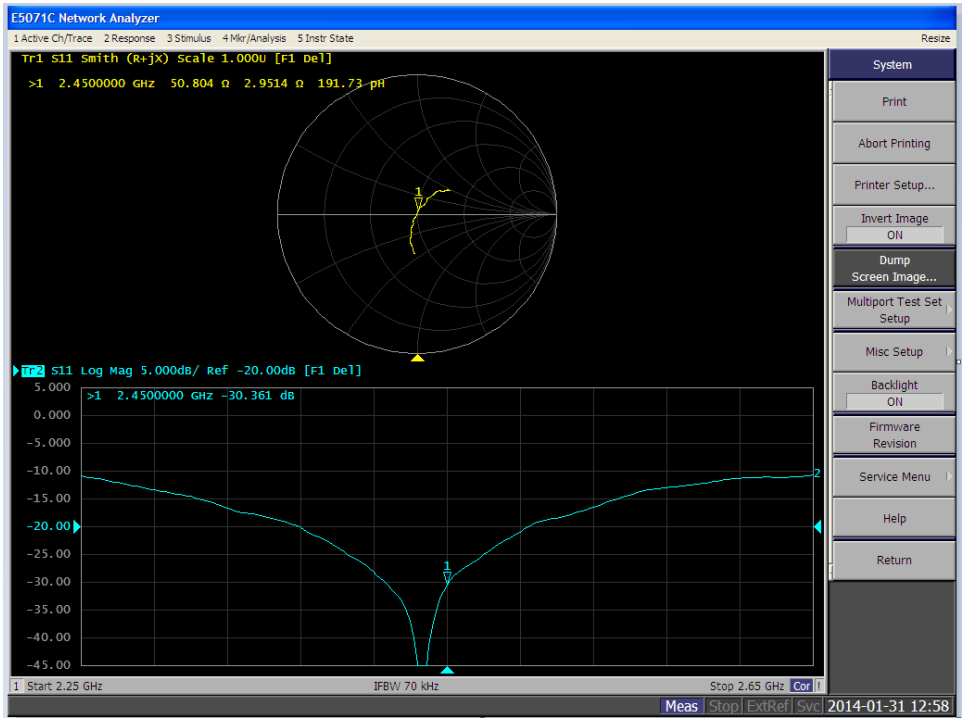
Antenna Parameters with Head TSL

	Calibration certificate	Annual measurement
Impedance, transformed to feed point	52.6 Ω - 3.4 jΩ	50.8 Ω - 3.0 jΩ
Return loss	-27.7 dB	-30.4 dB

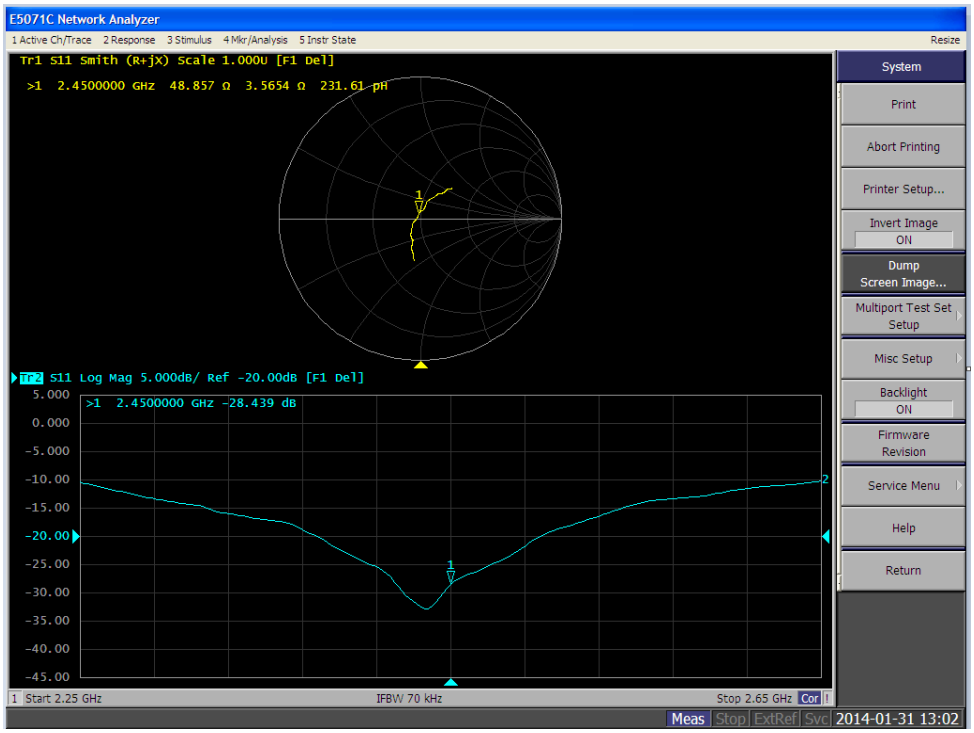
Antenna Parameters with Body TSL

	Calibration certificate	Annual measurement
Impedance, transformed to feed point	49.5 Ω - 4.3 jΩ	48.9 Ω - 3.6 jΩ
Return loss	-27.3 dB	-28.4 dB

Impedance Measurement Plot for Head TSL 2450



Impedance Measurement Plot for Body TSL 2450



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

F.1 Power Tuning Targets

GSM/GPRS/EGPRS850 Tuning targets for Head and Body-worn			
Slot configuration	Low channel	Mid channel	High channel
GSM 1-slot	32.0	32.0	32.0
GPRS 2-slot	31.0	31.0	31.0
GPRS 3-slot	29.2	29.2	29.2
GPRS 4-slot	28.0	28.0	28.0
EGPRS 1-slot	26.5	26.5	26.5
EGPRS 2-slot	26.5	26.5	26.5
EGPRS 3-slot	26.2	26.2	26.2
EGPRS 4-slot	25.0	25.0	25.0

GSM/GPRS/EGPRS1900 Tuning targets for Head and Body-worn			
Slot configuration	Low channel	Mid channel	High channel
GSM 1-slot	28.6	28.6	28.6
GPRS 2-slot	25.6	25.6	25.6
GPRS 3-slot	23.8	23.8	23.8
GPRS 4-slot	22.6	22.6	22.6
EGPRS 1-slot	25.5	25.5	25.5
EGPRS 2-slot	24.6	24.6	24.6
EGPRS 3-slot	23.3	23.3	23.3
EGPRS 4-slot	22.1	22.1	22.1

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GSM/GPRS/EGPRS850 Tuning targets for Wireless Router			
Slot configuration	Low channel	Mid channel	High channel
GSM 1-slot	32.0	32.0	32.0
GPRS 2-slot	29.0	29.0	29.0
GPRS 3-slot	27.2	27.2	27.2
GPRS 4-slot	26.0	26.0	26.0
EGPRS 1-slot	26.5	26.5	26.5
EGPRS 2-slot	26.5	26.5	26.5
EGPRS 3-slot	26.2	26.2	26.2
EGPRS 4-slot	25.0	25.0	25.0

GSM/GPRS/EGPRS1900 Tuning targets for Wireless Router			
Slot configuration	Low channel	Mid channel	High channel
GSM 1-slot	23.5	23.5	23.5
GPRS 2-slot	21.5	21.5	21.5
GPRS 3-slot	19.5	19.5	19.5
GPRS 4-slot	17.5	17.5	17.5
EGPRS 1-slot	23.5	23.5	23.5
EGPRS 2-slot	21.5	21.5	21.5
EGPRS 3-slot	19.5	19.5	19.5
EGPRS 4-slot	17.5	17.5	17.5

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

Type: RM-976; Serial number 004402/47/596097/1 used for GSM/GPRS/EGPRS850 and GSM/GPRS/EGPRS1900 SAR Head and Body-worn measurements.

GSM/GPRS/EGPRS850, HW:2201 Conducted powers for Head and Body-worn			
Slot configuration	Low channel	Mid channel	High channel
GSM 1-slot	31.9	31.9	32.0
GPRS 2-slot	31.1	30.9	31.0
GPRS 3-slot	29.3	29.2	29.2
GPRS 4-slot	28.2	28.1	28.0
EGPRS 1-slot	26.7	26.5	26.5
EGPRS 2-slot	26.7	26.5	26.4
EGPRS 3-slot	26.4	26.2	26.1
EGPRS 4-slot	25.1	24.9	24.8

GSM/GPRS/EGPRS1900, HW:2201 Conducted powers for Head and Body-worn			
Slot configuration	Low channel	Mid channel	High channel
GSM 1-slot	28.8	28.7	28.5
GPRS 2-slot	25.9	25.7	25.4
GPRS 3-slot	23.9	23.7	23.4
GPRS 4-slot	22.9	22.7	22.4
EGPRS 1-slot	25.7	25.4	25.1
EGPRS 2-slot	24.9	24.6	24.4
EGPRS 3-slot	23.5	23.2	23.0
EGPRS 4-slot	22.4	22.1	21.9

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Type: RM-976; Serial number 004402/47/729490/8 used for GSM/GPRS/EGPRS850 and GSM/GPRS/EGPRS1900 SAR Head and Body-worn measurements.

GSM/GPRS/EGPRS850, HW:2300 Conducted powers for Head and Body-worn			
Slot configuration	Low channel	Mid channel	High channel
GSM 1-slot	32.3	32.4	32.2
GPRS 2-slot	31.2	30.9	31.1
GPRS 3-slot	29.2	29.0	29.0
GPRS 4-slot	27.9	27.5	27.7
EGPRS 1-slot	26.6	26.3	26.4
EGPRS 2-slot	26.6	26.2	26.3
EGPRS 3-slot	26.3	25.9	25.9
EGPRS 4-slot	24.9	24.6	24.5

GSM/GPRS/EGPRS1900, HW:2300 Conducted powers for Head and Body-worn			
Slot configuration	Low channel	Mid channel	High channel
GSM 1-slot	28.9	28.8	28.5
GPRS 2-slot	25.9	25.6	25.5
GPRS 3-slot	24.1	23.9	23.8
GPRS 4-slot	23.0	22.7	22.5
EGPRS 1-slot	25.8	25.5	25.4
EGPRS 2-slot	25.0	24.8	24.6
EGPRS 3-slot	23.7	23.4	23.3
EGPRS 4-slot	22.5	22.3	22.1

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Type: RM-976; Serial number 004402/47/596221/7 used for GSM/GPRS/EGPRS850 SAR Wireless Router measurements.

GSM/GPRS/EGPRS850, HW:2201 Conducted powers for Wireless Router			
Slot configuration	Low channel	Mid channel	High channel
GSM 1-slot	32.2	32.2	32.2
GPRS 2-slot	29.2	29.1	29.1
GPRS 3-slot	27.3	27.3	27.2
GPRS 4-slot	26.2	26.2	26.1
EGPRS 1-slot	26.6	26.6	26.5
EGPRS 2-slot	26.6	26.4	26.4
EGPRS 3-slot	26.1	25.9	25.8
EGPRS 4-slot	25.0	25.0	24.8

Type: RM-976; Serial number 004402/47/596098/8 used for GSM/GPRS/EGPRS1900 SAR Wireless Router measurements.

GSM/GPRS/EGPRS1900, HW:2201 Conducted powers for Wireless Router			
Slot configuration	Low channel	Mid channel	High channel
GSM 1-slot	23.7	23.5	23.5
GPRS 2-slot	21.7	21.5	21.5
GPRS 3-slot	19.8	19.6	19.4
GPRS 4-slot	17.7	17.6	17.5
EGPRS 1-slot	23.5	23.2	23.1
EGPRS 2-slot	21.6	21.4	21.3
EGPRS 3-slot	19.8	19.8	19.6
EGPRS 4-slot	17.7	17.4	17.5

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Type: RM-976; Serial number 004402/47/729495/7 used for GSM/GPRS/EGPRS850 and GSM/GPRS/EGPRS1900 SAR Wireless Router measurements.

GSM/GPRS/EGPRS850, HW:2300 Conducted powers for Wireless Router			
Slot configuration	Low channel	Mid channel	High channel
GSM 1-slot	32.0	31.9	32.0
GPRS 2-slot	28.8	28.6	28.9
GPRS 3-slot	27.1	26.8	27.0
GPRS 4-slot	25.8	25.6	25.9
EGPRS 1-slot	26.4	26.3	26.4
EGPRS 2-slot	26.3	26.1	26.3
EGPRS 3-slot	26.4	26.1	26.2
EGPRS 4-slot	25.3	25.1	25.2

GSM/GPRS/EGPRS1900, HW:2300 Conducted powers for Wireless Router			
Slot configuration	Low channel	Mid channel	High channel
GSM 1-slot	23.2	23.0	23.0
GPRS 2-slot	21.4	21.1	21.1
GPRS 3-slot	19.5	19.2	19.0
GPRS 4-slot	17.4	17.1	17.2
EGPRS 1-slot	23.5	23.2	23.2
EGPRS 2-slot	21.8	21.5	21.5
EGPRS 3-slot	19.5	19.2	19.1
EGPRS 4-slot	17.2	17.1	17.0

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APPENDIX G: CONDUCTED POWER MEASUREMENTS FOR SUPPORTED WLAN TRANSMISSION MODES

G.1 Power Tuning Targets

WLAN 2.4GHz: 20MHz channel bandwidth, tuning targets								
Standard	Modulation	Data speed [MBPS]	CH 1	CH 2	CH 3	CH 4	CH 5	CH 6
802.11b	BPSK	1	16.5	16.5	16.5	16.5	16.5	16.5
802.11b	QPSK	2	16.5	16.5	16.5	16.5	16.5	16.5
802.11b	QPSK	5.5	16.5	16.5	16.5	16.5	16.5	16.5
802.11b	QPSK	11	16.5	16.5	16.5	16.5	16.5	16.5
802.11g	BPSK	6	12	16.5	16.5	16.5	16.5	16.5
802.11g	BPSK	9	12	16.5	16.5	16.5	16.5	16.5
802.11g	QPSK	12	12	16.5	16.5	16.5	16.5	16.5
802.11g	QPSK	18	12	16.5	16.5	16.5	16.5	16.5
802.11g	16QAM	24	12	16	16	16	16	16
802.11g	16QAM	36	12	16	16	16	16	16
802.11g	64QAM	48	12	14	14	14	14	14
802.11g	64QAM	54	12	13	13	13	13	13
802.11n	BPSK	6.5 / 7.25	12	16.5	16.5	16.5	16.5	16.5
802.11n	QPSK	13.0 / 14.4	12	16.5	16.5	16.5	16.5	16.5
802.11n	QPSK	19.5 / 21.7	12	16.5	16.5	16.5	16.5	16.5
802.11n	16QAM	26.0 / 28.9	12	16.5	16.5	16.5	16.5	16.5
802.11n	16QAM	39.0 / 43.3	12	15	15	15	15	15
802.11n	64QAM	52.0 / 57.8	12	14	14	14	14	14
802.11n	64QAM	58.5 / 65.0	12	12	12	12	12	12
802.11n	64QAM	65.0 / 72.2	11	11	11	11	11	11
802.11n	BPSK	13.0 / 14.4	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	QPSK	26.0 / 28.9	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	QPSK	39.0 / 43.3	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	16QAM	52.0 / 57.8	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	16QAM	78.0 / 86.7	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	64QAM	104.0 / 115.6	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	64QAM	117.0 / 130.0	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	64QAM	130.0 / 144.4	N/A	N/A	N/A	N/A	N/A	N/A

(WLAN 2.4 GHz tuning targe table continues)

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(WLAN 2.4 GHz tuning targe table continues)

WLAN 2.4GHz: 20MHz channel bandwidth, tuning targets							
Standard	Modulation	Data speed [MBPS]	CH 7	CH 8	CH 9	CH 10	CH 11
802.11b	BPSK	1	16.5	16.5	16.5	16.5	16.5
802.11b	QPSK	2	16.5	16.5	16.5	16.5	16.5
802.11b	QPSK	5.5	16.5	16.5	16.5	16.5	16.5
802.11b	QPSK	11	16.5	16.5	16.5	16.5	16.5
802.11g	BPSK	6	16.5	16.5	16.5	16.5	12
802.11g	BPSK	9	16.5	16.5	16.5	16.5	12
802.11g	QPSK	12	16.5	16.5	16.5	16.5	12
802.11g	QPSK	18	16.5	16.5	16.5	16.5	12
802.11g	16QAM	24	16	16	16	16	12
802.11g	16QAM	36	16	16	16	16	12
802.11g	64QAM	48	14	14	14	14	12
802.11g	64QAM	54	13	13	13	13	12
802.11n	BPSK	6.5 / 7.25	16.5	16.5	16.5	16.5	12
802.11n	QPSK	13.0 / 14.4	16.5	16.5	16.5	16.5	12
802.11n	QPSK	19.5 / 21.7	16.5	16.5	16.5	16.5	12
802.11n	16QAM	26.0 / 28.9	16.5	16.5	16.5	16.5	12
802.11n	16QAM	39.0 / 43.3	15	15	15	15	12
802.11n	64QAM	52.0 / 57.8	14	14	14	14	12
802.11n	64QAM	58.5 / 65.0	12	12	12	12	12
802.11n	64QAM	65.0 / 72.2	11	11	11	11	11
802.11n	BPSK	13.0 / 14.4	N/A	N/A	N/A	N/A	N/A
802.11n	QPSK	26.0 / 28.9	N/A	N/A	N/A	N/A	N/A
802.11n	QPSK	39.0 / 43.3	N/A	N/A	N/A	N/A	N/A
802.11n	16QAM	52.0 / 57.8	N/A	N/A	N/A	N/A	N/A
802.11n	16QAM	78.0 / 86.7	N/A	N/A	N/A	N/A	N/A
802.11n	64QAM	104.0 / 115.6	N/A	N/A	N/A	N/A	N/A
802.11n	64QAM	117.0 / 130.0	N/A	N/A	N/A	N/A	N/A
802.11n	64QAM	130.0 / 144.4	N/A	N/A	N/A	N/A	N/A

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G.2 Conducted Power from the Sample used in the Testing

Type: RM-976; Serial number 004402/47/596099/7 used for WLAN2450 SAR Head, Body-worn and Wireless Router measurements.

WLAN 2.4GHz: 20MHz channel bandwidth, measured values, HW:2201								
Standard	Modulation	Data speed [MBPS]	CH 1	CH 2 *	CH3	CH 4	CH 5	CH 6
802.11b	BPSK	1	16.87	17.13	-	-	-	17.00
802.11b	QPSK	2	17.09	17.16	-	-	-	17.05
802.11b	QPSK	5.5	17.18	17.49	-	-	-	17.58
802.11b	QPSK	11	17.25	17.15	-	-	-	17.22
802.11g	BPSK	6	11.98	16.96	-	-	-	17.20
802.11g	BPSK	9	12.13	17.19	-	-	-	17.19
802.11g	QPSK	12	11.96	17.00	-	-	-	17.20
802.11g	QPSK	18	11.95	17.02	-	-	-	17.29
802.11g	16QAM	24	12.16	17.05	-	-	-	17.11
802.11g	16QAM	36	12.10	16.06	-	-	-	16.29
802.11g	64QAM	48	12.19	15.42	-	-	-	15.26
802.11g	64QAM	54	11.94	13.41	-	-	-	13.39
802.11n	BPSK	6.5 / 7.25	12.20	17.20	-	-	-	17.27
802.11n	QPSK	13.0 / 14.4	12.21	17.23	-	-	-	17.14
802.11n	QPSK	19.5 / 21.7	12.25	17.11	-	-	-	17.37
802.11n	16QAM	26.0 / 28.9	12.26	17.19	-	-	-	17.23
802.11n	16QAM	39.0 / 43.3	12.27	15.30	-	-	-	15.29
802.11n	64QAM	52.0 / 57.8	11.96	14.12	-	-	-	14.42
802.11n	64QAM	58.5 / 65.0	12.13	12.03	-	-	-	12.35
802.11n	64QAM	65.0 / 72.2	11.14	11.26	-	-	-	11.73
802.11n	BPSK	13.0 / 14.4	-	-	-	-	-	-
802.11n	QPSK	26.0 / 28.9	-	-	-	-	-	-
802.11n	QPSK	39.0 / 43.3	-	-	-	-	-	-
802.11n	16QAM	52.0 / 57.8	-	-	-	-	-	-
802.11n	16QAM	78.0 / 86.7	-	-	-	-	-	-
802.11n	64QAM	104.0 / 115.6	-	-	-	-	-	-
802.11n	64QAM	117.0 / 130.0	-	-	-	-	-	-
802.11n	64QAM	130.0 / 144.4	-	-	-	-	-	-

(WLAN 2.4 GHz conducted power table continues)

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(WLAN 2.4 GHz conducted power table continues)

WLAN 2.4GHz: 20MHz channel bandwidth, measured values									
Standard	Modulation	Data speed [MBPS]	CH 7	CH 8	CH 9	CH 10 *	CH 11	CH 12 *	CH 13
802.11b	BPSK	1	17.06	-	-	17.14	16.98	-	-
802.11b	QPSK	2	17.12	-	-	17.17	17.18	-	-
802.11b	QPSK	5.5	17.23	-	-	17.50	17.35	-	-
802.11b	QPSK	11	17.26	-	-	17.37	17.18	-	-
802.11g	BPSK	6	17.23	-	-	17.28	12.29	-	-
802.11g	BPSK	9	17.20	-	-	17.31	12.05	-	-
802.11g	QPSK	12	17.30	-	-	17.34	12.35	-	-
802.11g	QPSK	18	17.15	-	-	17.42	12.34	-	-
802.11g	16QAM	24	17.29	-	-	17.19	12.12	-	-
802.11g	16QAM	36	16.14	-	-	16.13	11.98	-	-
802.11g	64QAM	48	15.14	-	-	15.39	11.79	-	-
802.11g	64QAM	54	13.17	-	-	13.36	12.05	-	-
802.11n	BPSK	6.5 / 7.25	17.31	-	-	17.42	12.37	-	-
802.11n	QPSK	13.0 / 14.4	17.39	-	-	17.30	12.15	-	-
802.11n	QPSK	19.5 / 21.7	17.30	-	-	17.34	12.18	-	-
802.11n	16QAM	26.0 / 28.9	17.33	-	-	17.17	12.24	-	-
802.11n	16QAM	39.0 / 43.3	15.15	-	-	15.15	12.27	-	-
802.11n	64QAM	52.0 / 57.8	14.20	-	-	14.26	11.96	-	-
802.11n	64QAM	58.5 / 65.0	12.39	-	-	12.35	11.76	-	-
802.11n	64QAM	65.0 / 72.2	11.21	-	-	11.33	11.12	-	-
802.11n	BPSK	13.0 / 14.4	-	-	-	-	-	-	-
802.11n	QPSK	26.0 / 28.9	-	-	-	-	-	-	-
802.11n	QPSK	39.0 / 43.3	-	-	-	-	-	-	-
802.11n	16QAM	52.0 / 57.8	-	-	-	-	-	-	-
802.11n	16QAM	78.0 / 86.7	-	-	-	-	-	-	-
802.11n	64QAM	104.0 / 115.6	-	-	-	-	-	-	-
802.11n	64QAM	117.0 / 130.0	-	-	-	-	-	-	-
802.11n	64QAM	130.0 / 144.4	-	-	-	-	-	-	-

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