SAR TEST REPORT

Equipment Under Test	:	Notebook PC
Model No.	:	LGX12
Applicant	:	LG Electronics Inc.
Address of Applicant	:	19-1, Cheongho-ri, Jinwi-myeon, Pyeongtaek-si Gyeonggi-do, 451-713, Korea
FCC ID		BEJ9QK-LGX12
Device Category	:	Portable Device
Exposure Category	:	General Population/Uncontrolled Exposure
Date of Receipt	:	2009-04-09
Date of Test(s)	:	2009-04-22 ~ 2009-04-23
Date of Issue	:	2009-06-12
Max. SAR	:	0.053 W/kg (GPRS850), 0.055 W/kg (GPRS1900) 0.028 W/kg (WCDMA V), 0.046 W/kg (WCDMA II)

Standards:

FCC OET Bulletin 65 supplement C
IEEE 1528, 2003
ANSI/IEEE C95.1, C95.3

In the configuration tested, the EUT complied with the standards specified above.

Remarks:

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.
This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS Testing Korea Co., Ltd. or testing done by SGS Testing Korea Co., Ltd. in connection with distribution or use of the product described in this report must be approved by SGS Testing Korea Co., Ltd. in writing.

Tested by	**:**	**Leo Kim**		**2009-06-12**
Approved by	**:**	**Charles Kim**	C. K. Kim	**2009-06-12**

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1. General Information

1.1 Testing Laboratory

SGS Testing Korea Co., Ltd.
Wireless Div. 2FL, 18-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea 435-040
Telephone : +82 +31 428 5700
FAX : +82 +31 427 2371
Homepage : www.electrolab.kr.sgs.com

1.2 Details of Manufacturer

Manufacturer : LG Electronics (Kunshan) Computer Co., Ltd.
Address : 215300, 88#, Qianjin Road (E), Kunshan City, Jiangsu Province, China
Contact Person : Jong-Dae Lee
Phone No. : 82-31-610-5338
Fax No. : 82-31-610-5355

1.3 Version of Report

Version Number	Date	Revision
00	2009-04-27	Initial issue
01	2009-05-18	Revision 1
02	2009-06-12	Revision 2

1.4 Description of EUT(s)

EUT Type	: Notebook PC
Model	: LGX12
Serial Number	: N/A
Mode of Operation	: GSM 850, GSM 1900, WCDMA V, WCDMA II
Duty Cycle	: GPRS/EGPRS 12.5% & 25%, WCDMA 100%
Body worn Accessory	: None
Tx Frequency Range	: 824.2 ~ 848.8 MHz (GSM850), 1850.2 ~ 1909.8 MHz (GSM1900) 826.4 ~ 846.6 MHz (WCDMA V), 1852.4 ~ 1907.6 Mz (WCDMA II)
Conducted Max Power	: 32.8 dBm(GPRS850), 29.6 dBm(GPRS1900) 26.8 dBm(WCDMA V), 27.0 dBm(WCDMA II)
Battery Type	: DC 10.8V(Lithum-ion Battery)

1.5 Module Information

Ericsson 3G module	
Company	Ericsson AB
Module Name	F3507g
FCC ID	VV7-MBMF3507G-2

Realtek WLAN module	
Company	Realtek Semiconductor Corp.
Module Name	RTL8187SE(MS-6894)
FCC ID	TX2-RTL8187SE

Qcom BT module	
Company	Qcom Technology
Module Name	QBT400UB
FCC ID	RUJ-QBT400UB

1.6 Test Environment

Ambient temperature	: 21 ~ 22 ° C
Tissue Simulating Liquid	: 21 ~ 22 ° C
Relative Humidity	: 40 ~ 60 %

1.7 Operation Configuration

The device in GSM and WCDMA mode was controlled by using a Communication tester(CMU 200). Communication between the device and the tester was established by air link. For WLAN, the client provided a special driver and test program which can control the frequency and power of the module.. Measurements were performed at the lowest, middle and highest channels of the operating band. The EUT was set to maximum power level during all tests and at the beginning of each test the battery was fully charged.

The DASY4 system measures power drift during SAR testing by comparing e-field in the same location at the beginning and at the end of measurement. Based on the RF Power and antenna separation distance, stand-alone BT SAR and simultaneous SAR evaluation are not required.

1.8 EVALUATION PROCEDURES

- Power Reference Measurement Procedures

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The Minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 4 mm. This distance cannot be smaller than the Distance of sensor calibration points to probe tip as defined in the probe properties (for example, 2.7 mm for an ET3DV6 probe type).

- The entire evaluation of the spatial peak values is performed within the Post-processing engine (SEMCAD). The system always gives the maximum values for the 1 g and 10 g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

1. The extraction of the measured data (grid and values) from the Zoom Scan.
2. The calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
3. The generation of a high-resolution mesh within the measured volume
4. The interpolation of all measured values from the measurement grid to the high-resolution grid
5. The extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
6. The calculation of the averaged SAR within masses of 1g and 10g.

The probe is calibrated at the center of the dipole sensors that is located 1 to 2.7mm away from the probe tip. During measurements, the probe stops shortly above the phantom surface, depending on the probe and the surface detecting system. Both distances are included as parameters in the probe configuration file. The software always knows exactly how far away the measured point is from the surface. As the probe cannot directly measure at the surface, the values between the deepest measured point and the surface must be extrapolated. The angle between the probe axis and the surface normal line is less than 30 degree.

In the Area Scan, the gradient of the interpolation function is evaluated to find all the extreme of the SAR distribution. The uncertainty on the locations of the extreme is less than 1/20 of the grid size. Only local maximum within –2 dB of the global maximum are searched and passed for the Cube Scan measurement. In the Cube Scan, the interpolation function is used to extrapolate the Peak SAR from the lowest measurement points to the inner phantom surface (the extrapolation distance). The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5mm.

The maximum search is automatically performed after each area scan measurement. It is based on splines in two or three dimensions. The procedure can find the maximum for most SAR distributions even with relatively large grid spacing. After the area scanning measurement, the probe is automatically moved to a

position at the interpolated maximum. The following scan can directly use this position for reference, e.g., for a finer resolution grid or the cube evaluations. The 1g and 10g peak evaluations are only available for the predefined cube 7x7x7 scans. The routines are verified and optimized for the grid dimensions used in these cube measurements. The measured volume of 30x30x30mm contains about 30g of tissue. The first procedure is an extrapolation (incl. Boundary correction) to get the points between the lowest measured plane and the surface. The next step uses 3D interpolation to get all points within the measured volume. In the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is the moved around until the highest averaged SAR is found. If the highest SAR is found at the edge of the measured volume, the system will issue a warning: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

1.9 The SAR Measurement System

A photograph of the SAR measurement System is given in Fig. a. This SAR Measurement System uses a Computer-controlled 3-D stepper motor system (Speag Dasy 4 professional system). A Model ET3DV6 1782 E-field probe is used to determine the internal electric fields. The SAR can be obtained from the equation SAR= σ (|Ei|2)/ ρ where σ and ρ are the conductivity and mass density of the tissue-simulant. The DASY4 system for performing compliance tests consists of the following items:

•A standard high precision 6-axis robot (Staubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).

•A dosimeter probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.

•A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

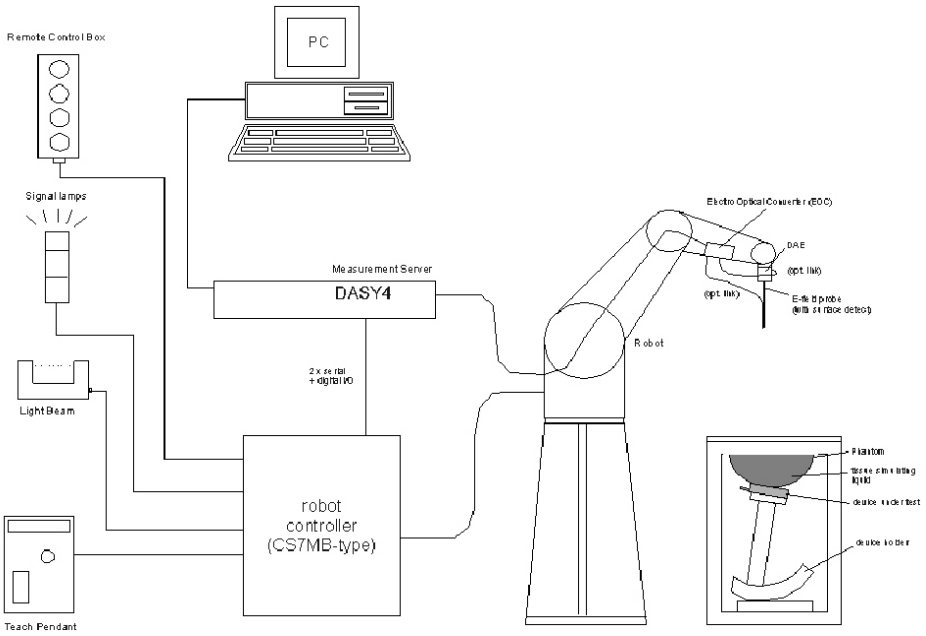


Fig a. The microwave circuit arrangement used for SAR system verification

• The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.

• The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.

• A probe alignment unit which improves the (absolute) accuracy of the probe positioning.

• A computer operating Windows 2000 or Windows XP.

• DASY4 software.

• Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.

• The SAM twin phantom enabling testing body usage.

• The device holder for flat phantom.

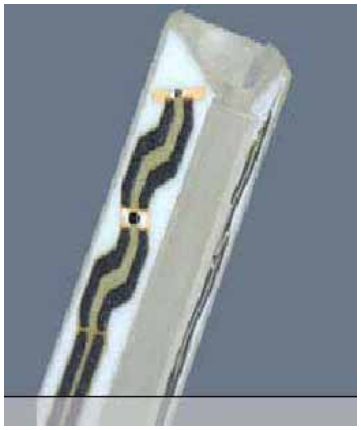
• Tissue simulating liquid mixed according to the given recipes.

• Validation dipole kits allowing to validate the proper functioning of the system.

1.10 System Components

ET3DV6 E-Field Probe

Construction	:	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g. glycol).
Calibration	:	In air from 10 MHz to 2.5 GHz In brain simulating tissue (accuracy ± 8%)
Frequency	:	10 MHz to >6 GHz; Linearity: ±0.2 dB (30 MHz to 3 GHz)
Directivity	:	±0.2 dB in brain tissue (rotation around probe axis) ±0.4 dB in brain tissue (rotation normal to probe axis)
Dynamic Range	:	5 µW/g to >100 mW/g; Linearity: ±0.2 dB
Srfce. Detect	:	±0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces
Dimensions	:	Overall length: 330 mm Tip length: 16 mm Body diameter: 12 mm Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm
Application	:	General dosimetry up to 3 GHz Compliance tests of mobile phone



ET3DV6 E-Field Probe

NOTE:

1. The Probe parameters have been calibrated by the SPEAG. Please reference “APPENDIX D” for the Calibration Certification Report.

SAM Phantom

Construction: The SAM Phantom is constructed of a fiberglass shell integrated in a wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot

Shell Thickness: 2.0 ± 0.1 mm

Filling Volume: Approx. 25 liters

SAM Phantom

DEVICE HOLDER

Construction In combination with the Twin SAM PhantomV4.0/V4.0C or Twin SAM, the Mounting Device (made from POM) enables the rotation of the mounted transmitter in spherical coordinates, whereby the rotation point is the ear opening. The devices can be easily and accurately positioned according to IEC, IEEE, CENELEC, FCC or other specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

Device Holder

1.11 SAR System Verification

The microwave circuit arrangement for system verification is sketched in Fig. b. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within +/- 10% from the target SAR values. These tests were done at 835MHz and 1900MHz. The tests for EUT were conducted within 24 hours after each validation. The obtained results from the system accuracy verification are displayed in the table 1. During the tests, the ambient temperature of the laboratory was in the range 20~23 °C, the relative humidity was in the range 40~60% and the liquid depth above the ear reference points was above 15 cm in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.

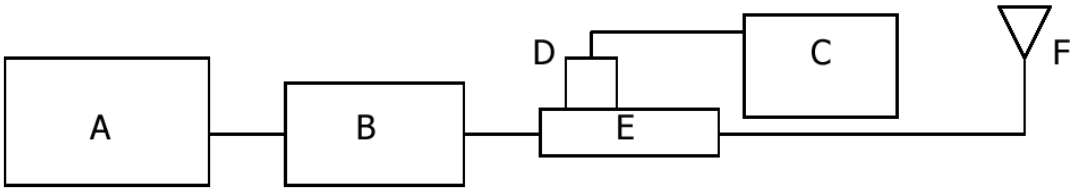


Fig b. The microwave circuit arrangement used for SAR system verification

A. Agilent Model E4421B Signal Generator
B. EMPOWER Model 2001-BBS3Q7ECK Amplifier
C. Agilent Model E4419B Power Meter
D. Agilent Model 9300H Power Sensor
E. Agilent Model 777D/778D Dual directional coupling
F. Reference dipole Antenna

Photo of the dipole Antenna

System Validation Results

Validation Kit	Tissue	Target SAR 1 g from Calibration Certificate (Input Power : 250 mW)	Measured SAR 1 g (Input Power : 250 mW)	Deviation (%)	Date	Liquid Temp. (°C)
D835V2 S/N: 490	835 MHz Brain	2.27 W/kg	**2.35 W/kg**	**3.52**	2009-04-22	22.4
D1900V2 S/N: 5d033	1900 MHz Brain	9.39 W/kg	**9.71 W/kg**	**3.41**	2009-04-23	22.4

Table 1. Results system validation

1.12 Tissue Simulant Fluid for the Frequency Band

The dielectric properties for this simulant fluid were measured by using the Agilent Model 85070D Dielectric Probe (rates frequence band 200 MHz to 20 GHz) in conjunction with Agilent E5070B Network Analyzer(300 KHz-3000 MHz) by using a procedure detailed in Section V.

f (MHz)	Tissue type	Limits / Measured	Dielectric Parameters		
			Permittivity	Conductivity	Simulated Tissue Temp(℃)
835	Head	Measured, 2009-04-22	**41.30**	**0.88**	**22.4**
		Recommended Limits	41.5	0.90	22.0
		Deviation(%)	-0.48	-2.22	-
	Body	Measured, 2009-04-22	**53.77**	**0.99**	**22.4**
		Recommended Limits	55.2	0.97	22.0
		Deviation(%)	-2.59	2.06	-
1900	Head	Measured, 2009-04-23	**38.26**	**1.44**	**22.4**
		Recommended Limits	40.0	1.40	22.0
		Deviation(%)	-4.35	2.86	-
	Body	Measured, 2009-04-23	**55.51**	**1.51**	**22.4**
		Recommended Limits	53.3	1.52	22.0
		Deviation(%)	4.15	-0.66	-

The composition of the brain tissue simulating liquid

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Ingredients (% by weight)	**Frequency (MHz)**									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (S/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Salt: 99^{+}% Pure Sodium Chloride Sugar: 98^{+}% Pure Sucrose

Water: De-ionized, 16 MΩ^{+} resistivity HEC: Hydroxyethyl Cellulose

DGBE: 99^{+}% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]

Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

1.13 Test Standards and Limits

According to FCC 47CFR §2.1093(d) The limits to be used for evaluation are based generally on criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (‘‘SAR’’) in Section 4.2 of ‘‘IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz,’’ ANSI/IEEE C95.3–2003, Copyright 2003 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in ‘‘Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields,’’ NCRP Report No. 86, Section 17.4.5. Copyright NCRP, 1986, Bethesda, Maryland 20814. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards. The criteria to be used are specified in paragraphs (d)(1) and (d)(2) of this section and shall apply for portable devices transmitting in the

frequency range from 100 kHz to 6 GHz. Portable devices that transmit at frequencies above 6 GHz are to be evaluated in terms of the MPE limits specified in § 1.1310 of this chapter. Measurements and calculations to demonstrate compliance with MPE field strength or power density limits for devices operating above 6 GHz should be made at a minimum distance of 5 cm from the radiating source.

(1) Limits for Occupational/Controlled exposure: 0.4 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 8 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 20 W/kg, as averaged over an 10 grams of tissue (defined as a tissue volume in the shape of a cube). Occupational/Controlled limits apply when persons are exposed as a consequence of their employment provided these persons are fully aware of and exercise control over their exposure. Awareness of exposure can be accomplished by use of warning labels or by specific training or education through appropriate means, such as an RF safety program in a work environment.

(2) Limits for General Population/Uncontrolled exposure: 0.08 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 1.6 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 4 W/kg, as averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). General Population/Uncontrolled limits apply when the general public may be exposed, or when persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or do not exercise control over their exposure. Warning labels placed on consumer devices such as cellular telephones will not be sufficient reason to allow these devices to be evaluated subject to limits for occupational/controlled exposure in paragraph (d)(1) of this section.(Table .4)

Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
Partial Peak SAR (Partial)	1.60 m W/g	8.00 m W/g
Partial Average SAR (Whole Body)	0.08 m W/g	0.40 m W/g
Partial Peak SAR (Hands/Feet/Ankle/Wrist)	4.00 m W/g	20.00 m W/g

Table .4 RF exposure limits

2. Instruments List

Maunfacturer	Device	Type	Serial Number	Due date of Calibration
Stäubli	Robot	RX90BL	F03/5W05A1/A/01	N/A
Schmid& Partner Engineering AG	Dosimetric E-Field Probe	ET3DV6	1783	November 14, 2009
Schmid& Partner Engineering AG	835 MHz System Validation Dipole	D835V2	490	August 27, 2009
Schmid& Partner Engineering AG	1900 MHz System Validation Dipole	D1900V2	5d033	August 28, 2009
Schmid& Partner Engineering AG	2450 MHz System Validation Dipole	D2450V2	734	August 20, 2009
Schmid& Partner Engineering AG	Data acquisition Electronics	DAE3	567	September 24, 2009
Schmid& Partner Engineering AG	Software	DASY 4 V4.7	-	N/A
Schmid& Partner Engineering AG	Phantom	SAM Phantom V4.0	TP-1299 TP-1300	N/A
Agilent	Network Analyzer	E5070B	MY42100282	April 1, 2010
Agilent	Dielectric Probe Kit	85070D	2184	N/A
Agilent	Power Meter	E4419B	GB43311126	October 1, 2009
Agilent	Power Sensor	E9300H	MY41495308	October 14, 2009
			MY41495314	October 6, 2009
Agilent	Signal Generator	E4421B	MY43350132	October 1, 2009
Empower RF Systems	Power Amplifier	2001-BBS3Q7ECK	1032 D/C 0336	April 1, 2010
Agilent	Dual Directional Coupler	777D 778D	50128 50454	October 1, 2009
Microlab	LP Filter	LA-15N LA-30N	N/A	October 1, 2009
R&S	Mobile Test Unit	CMU 200	107279	April 1, 2010

3.Summary of Results

FCC 3G Measurement Procedures

Maximum output power is verified on the Low, Middle and High channels according to the section 5.2 of 3GPP TS 34.121 and the KDB 941225 procedure.

Band	Channel	Frequency(MHz)	Conducted Power(dBm)	
			1 Tx Slot	2 Tx Slot
GPRS850	128	824.2	32.3	32.3
	190	836.6	32.8	32.7
	251	848.8	32.6	32.6
EGPRS850	128	824.2	30.6	30.4
	190	836.6	31.0	30.9
	251	848.8	30.6	30.5

Notes : Body SAR for GPRS/EGPRS evaluation was conducted in 1 & 2 Tx Slot.

Band	Channel	Frequency(MHz)	Conducted Power(dBm)	
			1 Tx Slot	2 Tx Slot
GPRS1900	512	1850.2	29.6	29.4
	661	1880.0	29.4	29.3
	810	1909.8	29.1	29.1
EGPRS1900	512	1850.2	28.5	28.4
	661	1880.0	28.3	28.3
	810	1909.8	28.0	27.9

Notes : Body SAR for GPRS/EGPRS evaluation was conducted in 1 & 2 Tx Slot.

Band	Mode	Channel	Frequency(MHz)	Conducted Power(dBm)
WCDMA V (RMC)	RMC	4132	826.4	**25.86**
	RMC	4183	836.6	**25.71**
	RMC	4233	846.6	**25.52**
WCDMA V (HSDPA Active)	Sub-test 1	4132	826.4	**26.78**
		4183	836.6	**26.75**
		4233	846.6	**26.31**
	Sub-test 2	4132	826.4	26.64
		4183	836.6	26.57
		4233	846.6	26.18
	Sub-test 3	4132	826.4	26.21
		4183	836.6	26.60
		4233	846.6	26.08
	Sub-test 4	4132	826.4	26.16
		4183	836.6	26.38
		4233	846.6	25.74

	βc	βd	△ACK, △NACK, △CQI	AGV
Sub-test 1	2	15	8	-
Sub-test 2	12	15	8	-
Sub-test 3	15	8	8	-
Sub-test 4	15	4	8	-

WCMA V (HSUPA)	Sub-test 1	4132	826.4	**26.78**
		4180	836.0	**26.70**
		4233	846.6	**26.31**
	Sub-test 2	4132	826.4	26.37
		4180	836.0	26.31
		4233	846.6	25.98
	Sub-test 3	4132	826.4	26.77
		4180	836.0	26.64
		4233	846.6	26.26
	Sub-test 4	4132	826.4	26.63
		4180	836.0	26.47
		4233	846.6	26.20
	Sub-test 5	4132	826.4	26.75
		4180	836.0	26.56
		4233	846.6	26.22

	βc	βd	△ACK, △NACK, △CQI	AGV
Sub-test 1	11	15	8	20
Sub-test 2	6	15	8	12
Sub-test 3	15	15	8	15
Sub-test 4	2	15	8	17
Sub-test 5	15	15	8	21

Module manufacturer statement on MPR implementation:

The MPR implementation in this device is a result of the ongoing development of Ericson F3507G module. During this development in crest compensation and power turn down mechanisms were optimized throughout a number of iterations. In early releases the relatively high output power in HSPA mode was reported and fixed. This fix in involves changes in the crest compensation and hardware compensation files.

At no point were the results outside of the requirements of 3GPP TS34.121. Therefore the patch to fix this issue is scheduled to be included in all firmware releases from R2A due later this year.

Notes : Body SAR evaluation for HSDPA and HSUPA was conducted in Sub-test 1.

Band	Mode	Channel	Frequency(MHz)	Conducted Power(dBm)
WCDMA II (RMC)	RMC	9262	1852.4	**25.85**
	RMC	9400	1880.0	**25.72**
	RMC	9538	1907.6	**25.21**
WCDMA II (HSDPA Active)	Sub-test 1	9262	1852.4	**26.95**
		9400	1880.0	**26.74**
		9538	1907.6	**26.15**
	Sub-test 2	9262	1852.4	26.89
		9400	1880.0	26.69
		9538	1907.6	26.01
	Sub-test 3	9262	1852.4	26.66
		9400	1880.0	26.51
		9538	1907.6	25.62
	Sub-test 4	9262	1852.4	26.20
		9400	1880.0	25.90
		9538	1907.6	25.36

	βc	βd	△ACK, △NACK, △CQI	AGV
Sub-test 1	2	15	8	-
Sub-test 2	12	15	8	-
Sub-test 3	15	8	8	-
Sub-test 4	15	4	8	-

WCMA II (HSUPA)	Sub-test 1	9262	1852.4	**27.01**
		9400	1880.0	**26.78**
		9538	1907.6	**26.05**
	Sub-test 2	9262	1852.4	26.89
		9400	1880.0	26.30
		9538	1907.6	25.63
	Sub-test 3	9262	1852.4	26.85
		9400	1880.0	26.66
		9538	1907.6	26.04
	Sub-test 4	9262	1852.4	26.94
		9400	1880.0	26.79
		9538	1907.6	25.99
	Sub-test 5	9262	1852.4	26.80
		9400	1880.0	26.80
		9538	1907.6	26.01

	βc	βd	△ACK, △NACK, △CQI	AGV
Sub-test 1	11	15	8	20
Sub-test 2	6	15	8	12
Sub-test 3	15	15	8	15
Sub-test 4	2	15	8	17
Sub-test 5	15	15	8	21

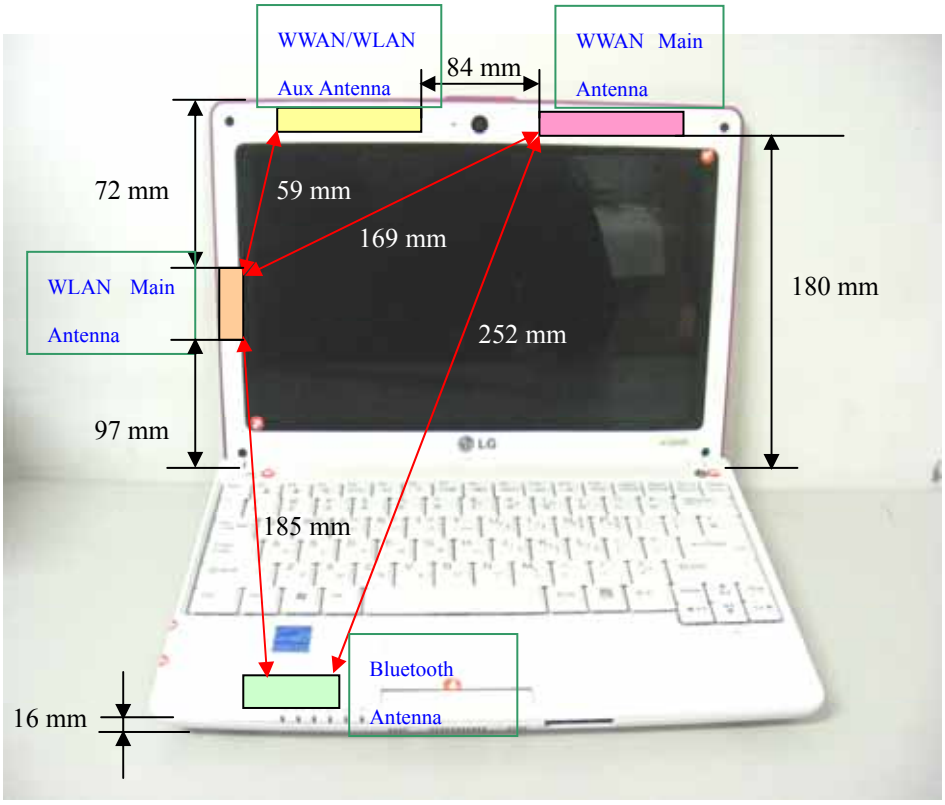
Module manufacturer statement on MPR implementation:

The MPR implementation in this device is a result of the ongoing development of Ericson F3507G module. During this development in crest compensation and power turn down mechanisms were optimized throughout a number of iterations. In early releases the relatively high output power in HSPA mode was reported and fixed. This fix in involves changes in the crest compensation and hardware compensation files.

At no point were the results outside of the requirements of 3GPP TS34.121. Therefore the patch to fix this issue is scheduled to be included in all firmware releases from R2A due later this year.

Notes : Body SAR evaluation for HSDPA and HSUPA was conducted in Sub-test 1.

KDB 616217 RF Exposure Assessments



Bluetooth-to-User = 16 mm

WLAN Main-to-User = 97 mm

WWAN Main-to-User = 180 mm

Aux-to-WWAN Main = 84 mm

Aux-to-WLAN Main = 59 mm

WLAN Main-to-WWAN Main = 169 mm

WLAN Main-to-Bluetooth = 185 mm

WWAN Main-to-Bluetooth = 252 mm

A. Individual SAR evaluation (Max)

- 802.11b at WLAN Main = 0.013 W/kg
- 850 MHz at WWAN Main = 0.053 W/kg
- 1900 MHz at WWAN Main = 0.055 W/kg
- WCDMA V at WWAN Main = 0.028 W/kg
- WCDMA II at WWAN Main = 0.046 W/kg
- Individial SAR for Bluetooth is not required.

B. Individual output power

- Bluetooth output power = 1.297 mW
- WLAN output power = 106.4 mW

- WWAN 850 MHz output power = 1905.5 mW
- WWAN 1900 MHz output power = 912 mW
- WWAN WCDMA V output power = 478.6 mW
- WWAN WCDMA II output power = 501.2 mW

C. Antenna-to- antenna and Antenna-to user ratio consideration

- n_x = WLAN = 3
- n_y = WWAN 850 MHz = 26 ; n_y = WWAN 1900 MHz = 28
- n_y = WWAN WCDMA V = 6 ; n_y = WWAN WCDMA II = 15
- WLAN-to-WWAN antenna ratio = (5+1/2* n_x + 1/2* n_y) = (5+1.5+14) =20.5 cm
- WLAN-to-user distance ratio = (5+1/2* n_x) = 6.5 cm
- WWAN-to-user distance ratio = (5+1/2* n_y) = 18 cm (WWAN 850 MHz)
- WWAN-to-user distance ratio = (5+1/2* n_y) = 19 cm (WWAN 1900 MHz)
- WWAN-to-user distance ratio = (5+1/2* n_y) = 8 cm (WWAN WCDMA V)
- WWAN-to-user distance ratio = (5+1/2* n_y) = 12.5 cm (WWAN WCDMA II)

D. Simultaneously SAR consideration

- WLAN main-to-WWAN main separation distance = 16.9 cm
- Aux antenna-to-WLAN main antenna separation distance = 5.9 cm
- WLAN main-to-Bluetooth = 18.5
- WLAN main-to-user = 9.7 cm
- WWAN main-to-user = 18 cm

KDB 616217

** The closest antenna-to-antenna distance is > 5 cm, WLAN and WWAN main antenna are more than 5 cm to the user, thus simultaneous SAR evaluation is not required.

** WWAN output power(GSM850) = 1905.5 mW > P_{th} , (GSM1900)=912 mW > $P_{th,}$ (WCDMA V)=478.6 mW > $P_{th,}$ (WCDMA II)=501.2 > P_{th}

WWAN main-to-user = 18 cm < R_i = 19 cm(GSM1900) ; Test according to normal procedure

WWAN main-to-user = 18 cm $\geq$ R_i = 18, 8, 12.5 cm(GSM850, WCDMAV, WCDMA II) ; Test highest output channel only

Ambient Temperature (°C)	22.4
Liquid Temperature (°C)	22.4
Date	2009-04-22

GSM850 Body SAR

Test Mode	EUT Position	Traffic Channel		Power Drift(dB)	1 g SAR (W/kg)	1 g SAR Limits (W/kg)
		Frequency (MHz)	Channel			
GPRS	Bottom of Base	824.2	128	0.038	**0.053**	1.6
	Bottom of Base	836.6	190	-0.080	0.043	
	Bottom of Base	848.8	251	-0.042	0.031	
EGPRS	Bottom of Base	824.2	128	-0.111	0.020	
GPRS Slot 1 Up	Bottom of Base	824.2	128	-0.059	0.031	

Ambient Temperature (°C)	22.3
Liquid Temperature (°C)	22.3
Date	2009-04-23

GSM1900 Body SAR

Test Mode	EUT Position	Traffic Channel		Power Drift(dB)	1 g SAR (W/kg)	1 g SAR Limits (W/kg)
		Frequency (MHz)	Channel			
GPRS	Bottom of Base	1850.2	512	-0.177	**0.055**	1.6
	Bottom of Base	1880.0	661	0.122	0.047	
	Bottom of Base	1909.8	810	0.113	0.030	
EGPRS	Bottom of Base	1850.2	512	0.048	0.031	
GPRS Slot 1 Up	Bottom of Base	1850.2	512	0.107	0.030	

Ambient Temperature (°C)	22.3
Liquid Temperature (°C)	22.3
Date	2009-04-22

WCDMA V Body SAR

Test Mode	EUT Position	Traffic Channel		Power Drift(dB)	1 g SAR (W/kg)	1 g SAR Limits (W/kg)
		Frequency (MHz)	Channel			
RMC	Bottom of Base	826.4	4132	-0.095	0.027	1.6
	Bottom of Base	836.0	4180	-0.158	0.025	
	Bottom of Base	846.6	4233	0.043	0.019	
HSUPA	Bottom of Base	826.4	4132	-0.029	**0.028**	
HSDPA Active	Bottom of Base	826.4	4132	-0.040	0.028	

Ambient Temperature (°C)	22.3
Liquid Temperature (°C)	22.3
Date	2009-04-23

WCDMA II Body SAR

Test Mode	EUT Position	Traffic Channel		Power Drift(dB)	1 g SAR (W/kg)	1 g SAR Limits (W/kg)
		Frequency (MHz)	Channel			
RMC	Bottom of Base	1852.4	9262	-0.002	0.042	1.6
	Bottom of Base	1880.0	9400	0.107	0.036	
	Bottom of Base	1907.6	9538	0.015	0.032	
HSUPA	Bottom of Base	1852.4	9262	-0.065	0.043	
HSDPA Active	Bottom of Base	1852.4	9262	-0.001	**0.046**	

Appendix

List

Appendix A	Photographs	- EUT - Test Setup
Appendix B	DASY4 Report (Plots of the SAR Measurements)	- 850, 1900 MHz Validation Test - GSM850 Test - GSM1900 Test
Appendix C	Uncertainty Analysis	
Appendix D	Calibration Certificate	- PROBE - DAE - DIPOLE

Appendix A

EUT Photographs

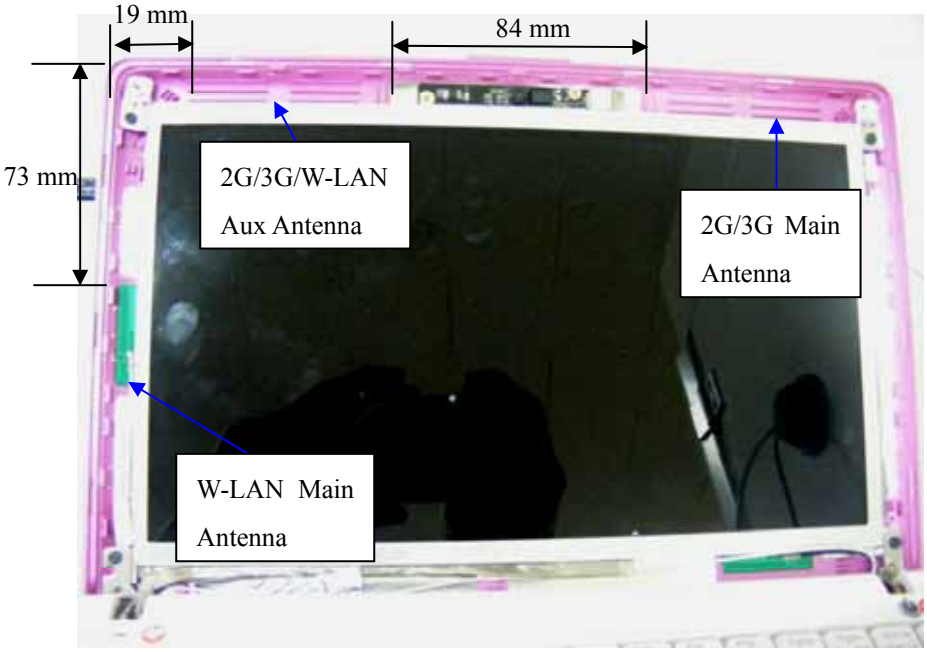
Top View of EUT

Bottom View of EUT

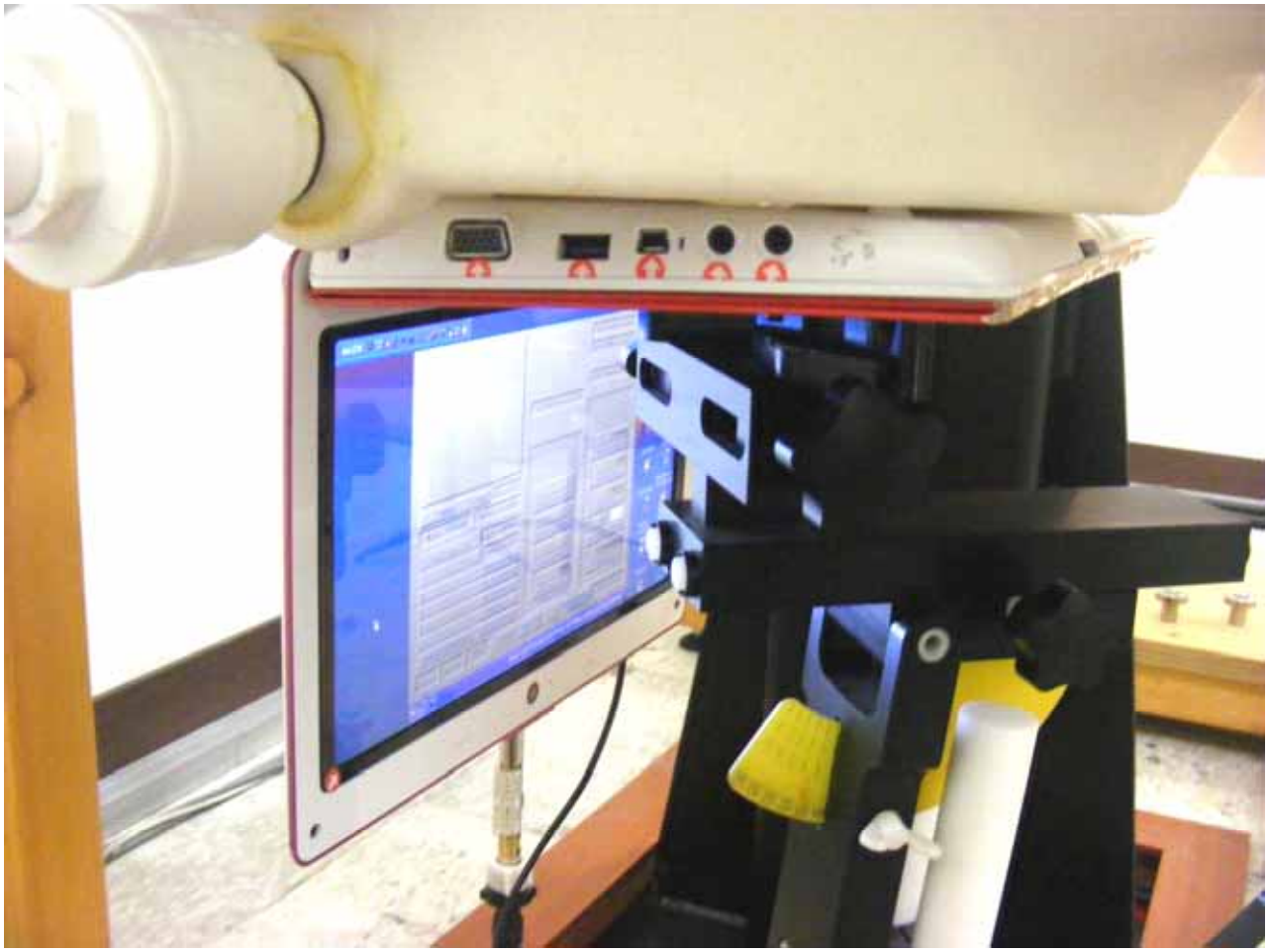
Right Side View of EUT

Left Side View of EUT

Antenna of EUT



Test Setup Photographs



Appendix B

Test Plot - DASY4 Report

835 MHz Validation Test

Date/Time: 2009-04-22 11:00:09

Test Laboratory: SGS Testing Korea
File Name: Validation_835 MHz.da4

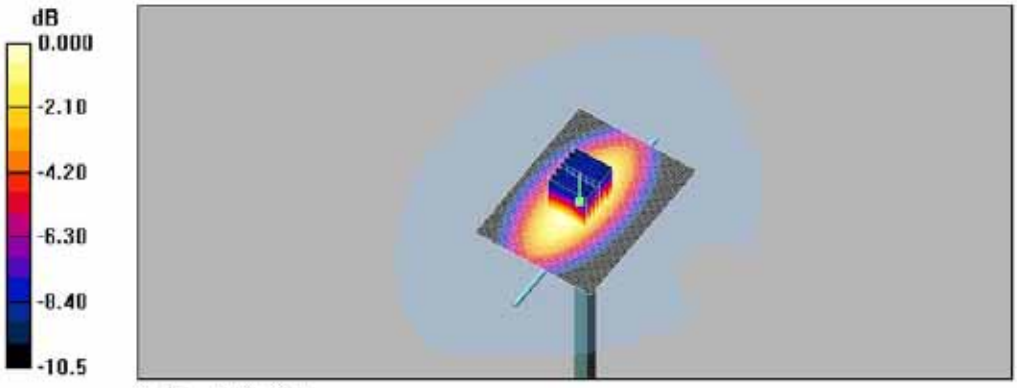
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:490
Program Name: Validation_835 MHz

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.883 mho/m; ε_r = 41.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1783; ConvF(6.13, 6.13, 6.13); Calibrated: 2008-11-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2008-09-24
- Phantom: SAM MIC #2000-93 with CRP_900MHz; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Validation_835 MHz/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.51 mW/g

Validation_835 MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.6 V/m; Power Drift = 0.008 dB
Peak SAR (extrapolated) = 3.94 W/kg
SAR(1 g) = 2.35 mW/g; SAR(10 g) = 1.51 mW/g
Maximum value of SAR (measured) = 2.50 mW/g



0 dB = 2.50mW/g

1900 MHz Validation Test

Date/Time: 2009-04-23 10:00:11

Test Laboratory: SGS Testing Korea
File Name: Validation_1900 MHz.da4

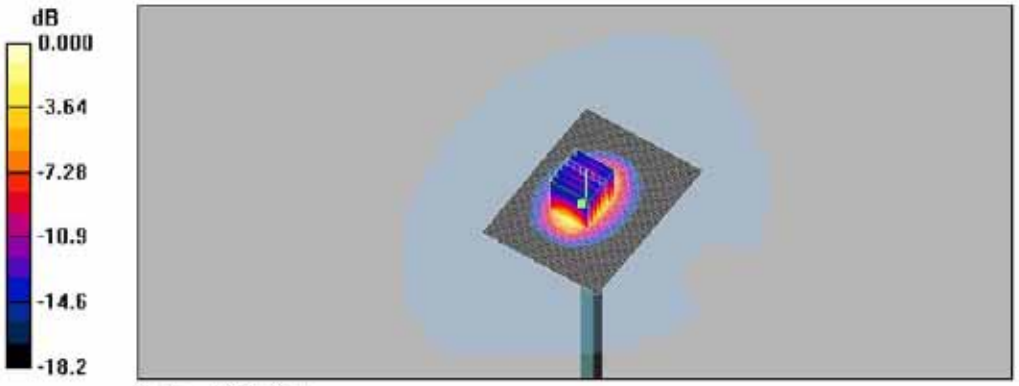
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d033
Program Name: Validation_1900 MHz

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.44 mho/m; ε_r = 38.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1783; ConvF(4.92, 4.92, 4.92); Calibrated: 2008-11-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2008-09-24
- Phantom: SAM MIC #2000-93 with CRP; Type: SAM MIC #2000-93; Serial: TP-1299
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Validation_1900 MHz/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 11.0 mW/g

Validation_1900 MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 80.0 V/m; Power Drift = 0.004 dB
Peak SAR (extrapolated) = 20.9 W/kg
SAR(1 g) = 9.71 mW/g; SAR(10 g) = 4.9 mW/g
Maximum value of SAR (measured) = 10.7 mW/g



0 dB = 10.7mW/g

GSM 850 Body SAR Test

Date/Time: 2009-04-22 11:34:05

Test Laboratory: SGS Testing Korea
File Name: GSM850.da4

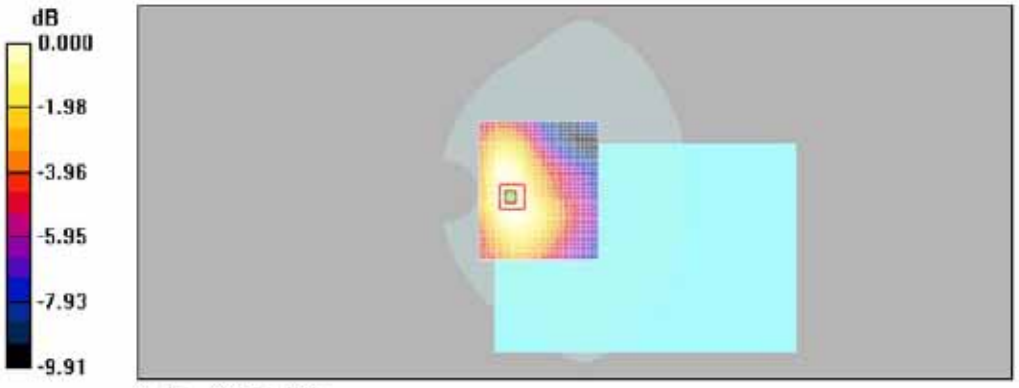
DUT: LGX12; Type: Notebook PC; Serial: N/A
Program Name: GSM 850 MHz

Communication System: GSM850; Frequency: 824.2 MHz;Duty Cycle: 1:4.15
Medium parameters used (interpolated): f = 824.2 MHz; σ = 0.96 mho/m; ε_r = 54; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1783; ConvF(5.89, 5.89, 5.89); Calibrated: 2008-11-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2008-09-24
- Phantom: SAM MIC #2000-93 with CRP_900MHz; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body_GPRS 850_Low/Area Scan (71x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.057 mW/g

Body_GPRS 850_Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.38 V/m; Power Drift = 0.038 dB
Peak SAR (extrapolated) = 0.089 W/kg
SAR(1 g) = 0.053 mW/g; SAR(10 g) = 0.036 mW/g
Maximum value of SAR (measured) = 0.055 mW/g



0 dB = 0.055mW/g

Date/Time: 2009-04-22 12:02:20

Test Laboratory: SGS Testing Korea
File Name: GSM850.da4

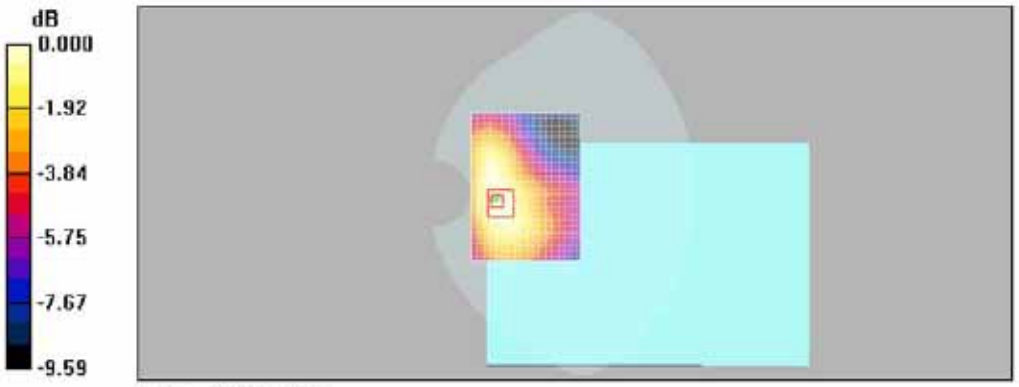
DUT: LGX12; Type: Notebook PC; Serial: N/A
Program Name: GSM 850 MHz

Communication System: GSM850; Frequency: 836.6 MHz;Duty Cycle: 1:4.15
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.973 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1783; ConvF(5.89, 5.89, 5.89); Calibrated: 2008-11-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2008-09-24
- Phantom: SAM MIC #2000-93 with CRP_900MHz; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body_GPRS 850_Mid/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.046 mW/g

Body_GPRS 850_Mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.89 V/m; Power Drift = -0.080 dB
Peak SAR (extrapolated) = 0.069 W/kg
SAR(1 g) = 0.043 mW/g; SAR(10 g) = 0.029 mW/g
Maximum value of SAR (measured) = 0.046 mW/g



0 dB = 0.046mW/g

Date/Time: 2009-04-22 1:04:17

Test Laboratory: SGS Testing Korea
File Name: GSM850.da4

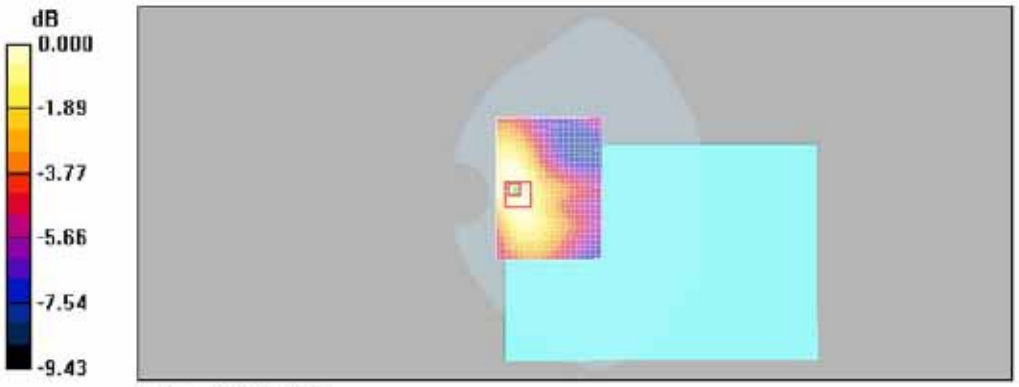
DUT: LGX12; Type: Notebook PC; Serial: N/A
Program Name: GSM 850 MHz

Communication System: GSM850; Frequency: 848.8 MHz;Duty Cycle: 1:4.15
Medium parameters used: f = 849 MHz; σ = 0.986 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1783; ConvF(5.89, 5.89, 5.89); Calibrated: 2008-11-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2008-09-24
- Phantom: SAM MIC #2000-93 with CRP_900MHz; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body_GPRS 850_High/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.033 mW/g

Body_GPRS 850_High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.25 V/m; Power Drift = -0.042 dB
Peak SAR (extrapolated) = 0.049 W/kg
SAR(1 g) = 0.031 mW/g; SAR(10 g) = 0.021 mW/g
Maximum value of SAR (measured) = 0.032 mW/g



0 dB = 0.032mW/g

Date/Time: 2009-04-22 1:33:42

Test Laboratory: SGS Testing Korea
File Name: GSM850.da4

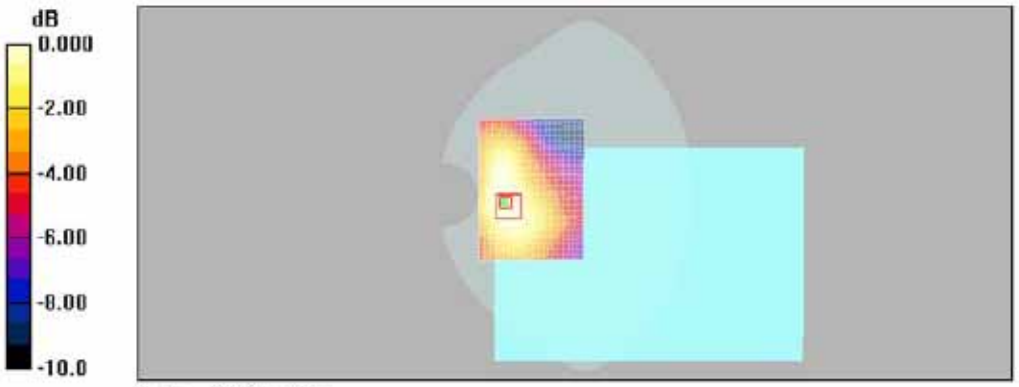
DUT: LGX12; Type: Notebook PC; Serial: N/A
Program Name: GSM 850 MHz

Communication System: GSM850; Frequency: 824.2 MHz;Duty Cycle: 1:4.15
Medium parameters used (interpolated): f = 824.2 MHz; σ = 0.96 mho/m; ε_r = 54; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1783; ConvF(5.89, 5.89, 5.89); Calibrated: 2008-11-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2008-09-24
- Phantom: SAM MIC #2000-93 with CRP_900MHz; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

EGPRS_Body_Low/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm.
Maximum value of SAR (interpolated) = 0.021 mW/g

EGPRS_Body_Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.65 V/m; Power Drift = -0.111 dB
Peak SAR (extrapolated) = 0.034 W/kg
SAR(1 g) = 0.020 mW/g; SAR(10 g) = 0.014 mW/g
Maximum value of SAR (measured) = 0.021 mW/g



0 dB = 0.021mW/g

Date/Time: 2009-04-22 1:58:26

Test Laboratory: SGS Testing Korea
File Name: GSM850_1Slot.da4

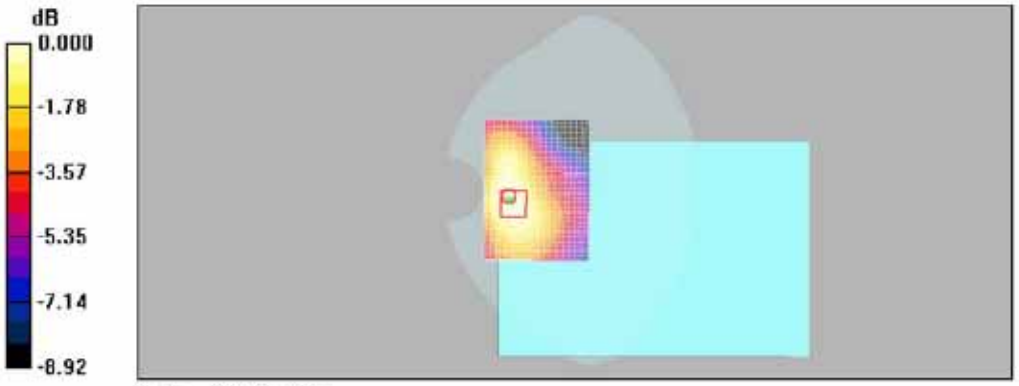
DUT: LGX12; Type: Notebook PC; Serial: N/A
Program Name: GSM 850 MHz

Communication System: GSM850; Frequency: 824.2 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 824.2 MHz; σ = 0.96 mho/m; ε_r = 54; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1783; ConvF(5.89, 5.89, 5.89); Calibrated: 2008-11-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2008-09-24
- Phantom: SAM MIC #2000-93 with CRP_900MHz; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body_GPRS 850_Low_Slot1/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.032 mW/g

Body_GPRS 850_Low_Slot1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.16 V/m; Power Drift = -0.059 dB
Peak SAR (extrapolated) = 0.051 W/kg
SAR(1 g) = 0.031 mW/g; SAR(10 g) = 0.021 mW/g
Maximum value of SAR (measured) = 0.033 mW/g



0 dB = 0.033mW/g

GSM1900 Body SAR Test

Date/Time: 2009-04-23 11:10:39

Test Laboratory: SGS Testing Korea
File Name: GSM1900.da4

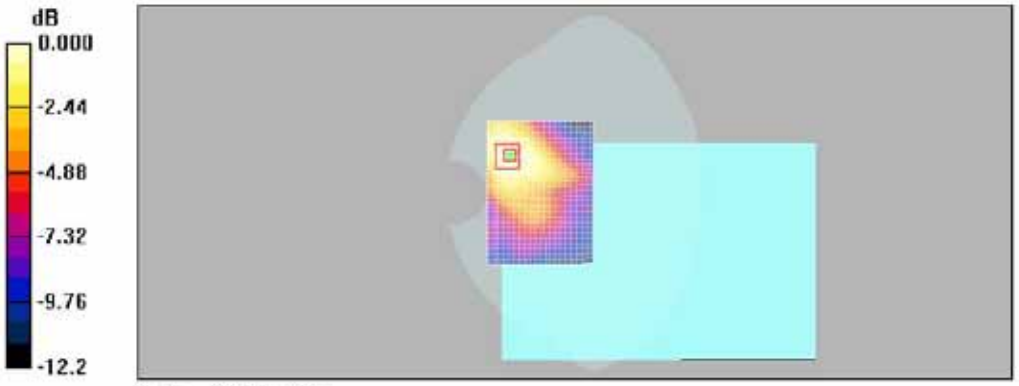
DUT: LGX12; Type: Notebook PC; Serial: N/A
Program Name: GSM1900 MHz

Communication System: PCS 1900; Frequency: 1850.2 MHz;Duty Cycle: 1:4.15
Medium parameters used (interpolated): f = 1850.2 MHz; σ = 1.49 mho/m; ε_r = 55.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1783; ConvF(4.63, 4.63, 4.63); Calibrated: 2008-11-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2008-09-24
- Phantom: SAM MIC #2000-93 with CRP; Type: SAM MIC #2000-93; Serial: TP-1299
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body_GPRS 1900 MHz_Low/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.059 mW/g

Body_GPRS 1900 MHz_Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.81 V/m; Power Drift = -0.177 dB
Peak SAR (extrapolated) = 0.106 W/kg
SAR(1 g) = 0.055 mW/g; SAR(10 g) = 0.035 mW/g
Maximum value of SAR (measured) = 0.057 mW/g



0 dB = 0.057mW/g

Date/Time: 2009-04-23 11:31:50

Test Laboratory: SGS Testing Korea
File Name: GSM1900.da4

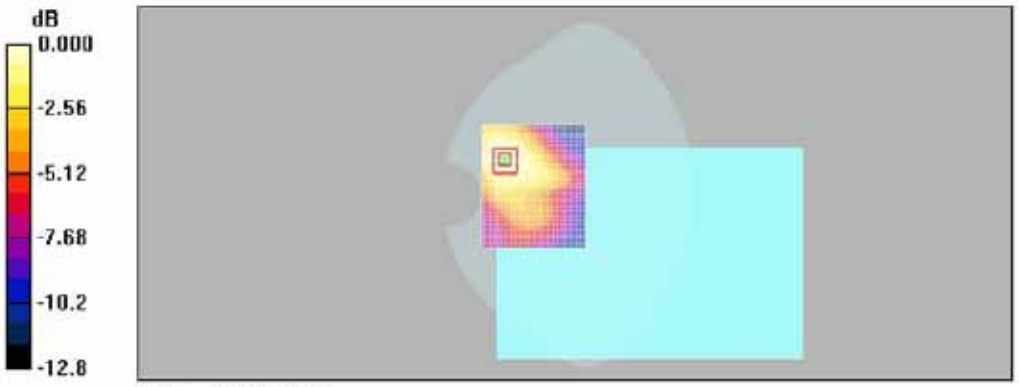
DUT: LGX12; Type: Notebook PC; Serial: N/A
Program Name: GSM1900 MHz

Communication System: PCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:4.15
Medium parameters used: f = 1880 MHz; σ = 1.49 mho/m; ε_r = 55.6; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1783; ConvF(4.63, 4.63, 4.63); Calibrated: 2008-11-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2008-09-24
- Phantom: SAM MIC #2000-93 with CRP; Type: SAM MIC #2000-93; Serial: TP-1299
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body_GPRS 1900 MHz_Mid/Area Scan (61x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.049 mW/g

Body_GPRS 1900 MHz_Mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.57 V/m; Power Drift = 0.122 dB
Peak SAR (extrapolated) = 0.099 W/kg
SAR(1 g) = 0.047 mW/g; SAR(10 g) = 0.029 mW/g
Maximum value of SAR (measured) = 0.049 mW/g



0 dB = 0.049mW/g

Date/Time: 2009-04-23 12:09:03

Test Laboratory: SGS Testing Korea
File Name: GSM1900.da4

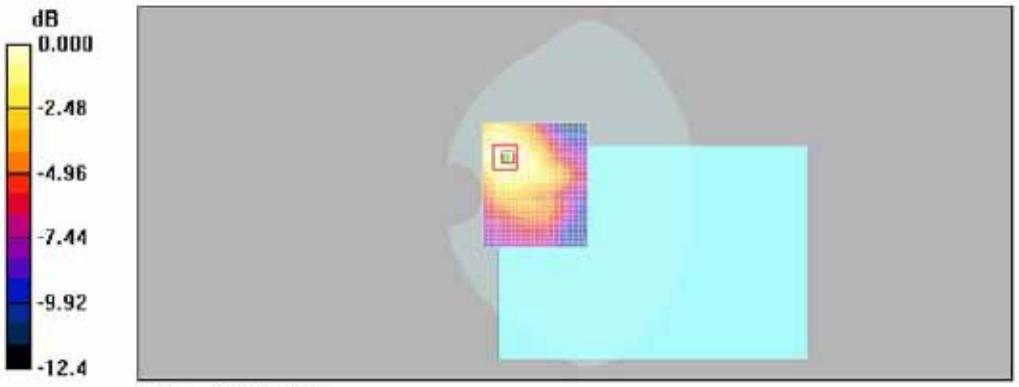
DUT: LGX12; Type: Notebook PC; Serial: N/A
Program Name: GSM1900 MHz

Communication System: PCS 1900; Frequency: 1909.8 MHz;Duty Cycle: 1:4.15
Medium parameters used: f = 1910 MHz; σ = 1.53 mho/m; ε_r = 55.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1783; ConvF(4.63, 4.63, 4.63); Calibrated: 2008-11-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2008-09-24
- Phantom: SAM MIC #2000-93 with CRP; Type: SAM MIC #2000-93; Serial: TP-1299
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body_GPRS 1900 MHz_High/Area Scan (61x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.031 mW/g

Body_GPRS 1900 MHz_High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.10 V/m; Power Drift = 0.113 dB
Peak SAR (extrapolated) = 0.062 W/kg
SAR(1 g) = 0.030 mW/g; SAR(10 g) = 0.019 mW/g
Maximum value of SAR (measured) = 0.032 mW/g



0 dB = 0.032mW/g

Date/Time: 2009-04-23 1:21:15

Test Laboratory: SGS Testing Korea
File Name: GSM1900.da4

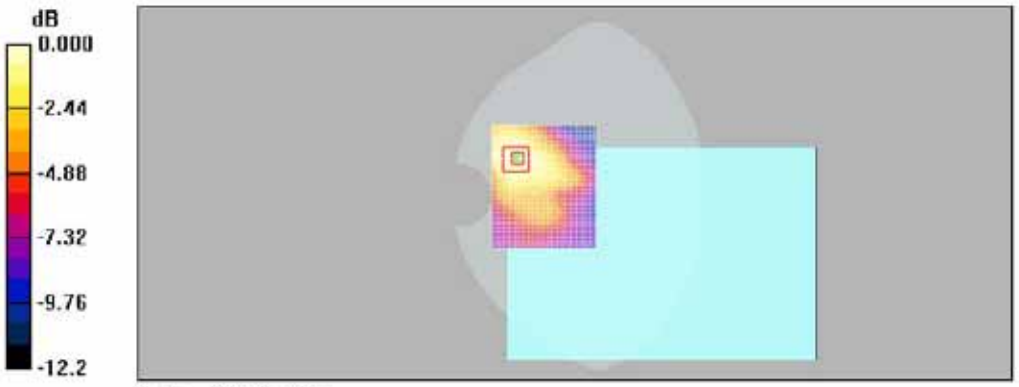
DUT: LGX12; Type: Notebook PC; Serial: N/A
Program Name: GSM1900 MHz

Communication System: PCS 1900; Frequency: 1850.2 MHz;Duty Cycle: 1:4.15
Medium parameters used (interpolated): f = 1850.2 MHz; σ = 1.49 mho/m; ε_r = 55.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1783; ConvF(4.63, 4.63, 4.63); Calibrated: 2008-11-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2008-09-24
- Phantom: SAM MIC #2000-93 with CRP; Type: SAM MIC #2000-93; Serial: TP-1299
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body_EGPRS 1900 MHz_Low/Area Scan (61x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.031 mW/g

Body_EGPRS 1900 MHz_Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.03 V/m; Power Drift = 0.048 dB
Peak SAR (extrapolated) = 0.066 W/kg
SAR(1 g) = 0.031 mW/g; SAR(10 g) = 0.019 mW/g
Maximum value of SAR (measured) = 0.032 mW/g



0 dB = 0.032mW/g

Date/Time: 2009-04-23 1:45:41

Test Laboratory: SGS Testing Korea
File Name: GSM1900_1Slot.da4

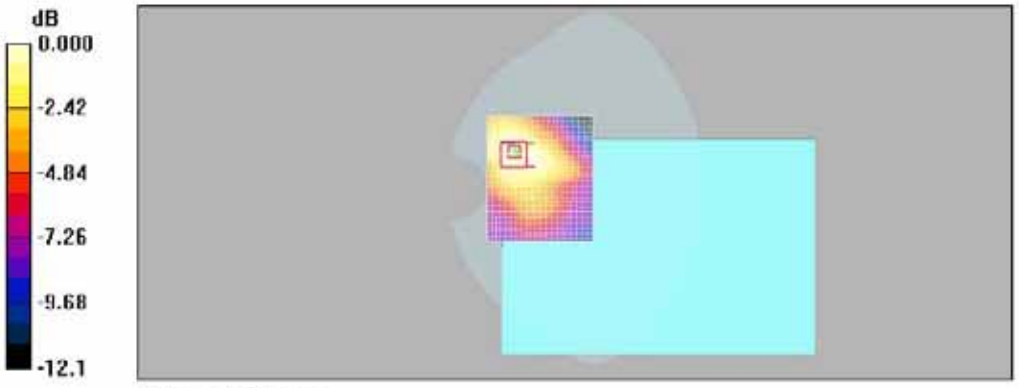
DUT: LGX12; Type: Notebook PC; Serial: N/A
Program Name: GSM1900 MHz

Communication System: PCS 1900; Frequency: 1850.2 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 1850.2 MHz; σ = 1.49 mho/m; ε_r = 55.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1783; ConvF(4.63, 4.63, 4.63); Calibrated: 2008-11-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2008-09-24
- Phantom: SAM MIC #2000-93 with CRP; Type: SAM MIC #2000-93; Serial: TP-1299
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body_GPRS 1900 MHz_Low_Slot 1/Area Scan (61x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.030 mW/g

Body_GPRS 1900 MHz_Low_Slot 1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.16 V/m; Power Drift = 0.107 dB
Peak SAR (extrapolated) = 0.064 W/kg
SAR(1 g) = 0.030 mW/g; SAR(10 g) = 0.018 mW/g
Maximum value of SAR (measured) = 0.031 mW/g



0 dB = 0.031mW/g

WCDMA V Body SAR Test

Date/Time: 2009-04-22 3:45:11

Test Laboratory: SGS Testing Korea
File Name: WCDMA V.da4

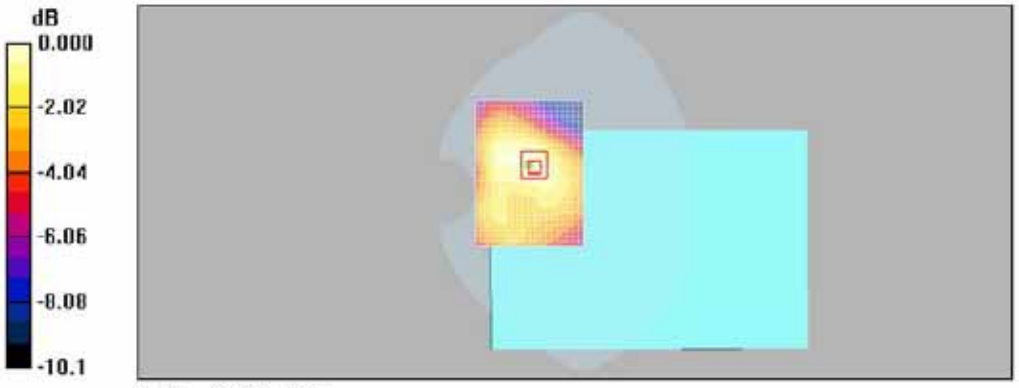
DUT: LGX12; Type: Notebook PC; Serial: N/A
Program Name: WCDMA V

Communication System: WCDMA V; Frequency: 826.4 MHz;Duty Cycle: 1:1
Medium parameters used: f = 826.5 MHz; σ = 0.963 mho/m; ε_r = 54; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1783; ConvF(5.89, 5.89, 5.89); Calibrated: 2008-11-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2008-09-24
- Phantom: SAM MIC #2000-93 with CRP_900MHz; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body_Low/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.027 mW/g

Body_Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.30 V/m; Power Drift = -0.095 dB
Peak SAR (extrapolated) = 0.049 W/kg
SAR(1 g) = 0.027 mW/g; SAR(10 g) = 0.017 mW/g
Maximum value of SAR (measured) = 0.028 mW/g



0 dB = 0.028mW/g

Date/Time: 2009-04-22 4:15:12

Test Laboratory: SGS Testing Korea
File Name: WCDMA V.da4

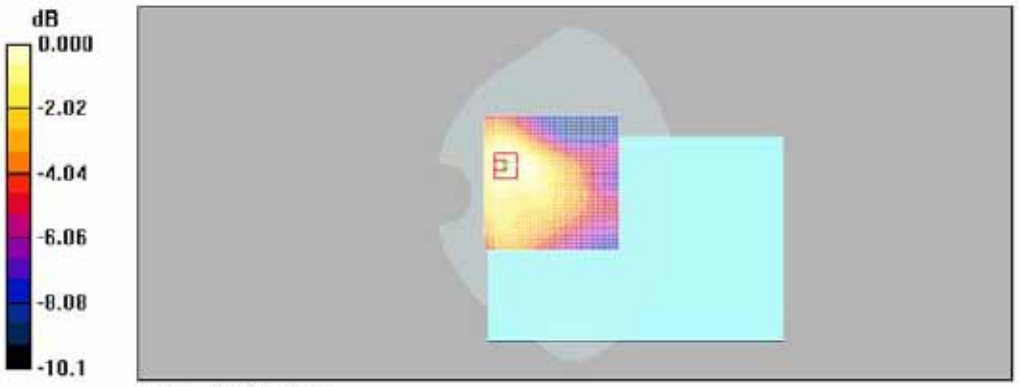
DUT: LGX12; Type: Notebook PC; Serial: N/A
Program Name: WCDMA V

Communication System: WCDMA V; Frequency: 836 MHz;Duty Cycle: 1:1
Medium parameters used: f = 836 MHz; σ = 0.972 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1783; ConvF(5.89, 5.89, 5.89); Calibrated: 2008-11-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2008-09-24
- Phantom: SAM MIC #2000-93 with CRP_900MHz; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body_Mid/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.026 mW/g

Body_Mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.08 V/m; Power Drift = -0.158 dB
Peak SAR (extrapolated) = 0.042 W/kg
SAR(1 g) = 0.025 mW/g; SAR(10 g) = 0.017 mW/g
Maximum value of SAR (measured) = 0.026 mW/g



0 dB = 0.026mW/g

Date/Time: 2009-04-22 4:47:44

Test Laboratory: SGS Testing Korea
File Name: WCDMA V.da4

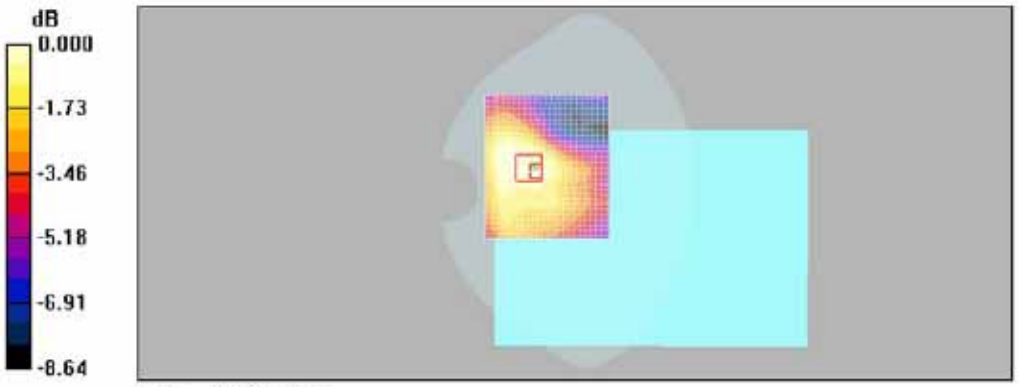
DUT: LGX12; Type: Notebook PC; Serial: N/A
Program Name: WCDMA V

Communication System: WCDMA V; Frequency: 846.6 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 846.6 MHz; σ = 0.983 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1783; ConvF(5.89, 5.89, 5.89); Calibrated: 2008-11-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2008-09-24
- Phantom: SAM MIC #2000-93 with CRP_900MHz; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body_High/Area Scan (71x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.021 mW/g

Body_High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.55 V/m; Power Drift = 0.043 dB
Peak SAR (extrapolated) = 0.034 W/kg
SAR(1 g) = 0.019 mW/g; SAR(10 g) = 0.012 mW/g
Maximum value of SAR (measured) = 0.020 mW/g



0 dB = 0.020mW/g

Date/Time: 2009-04-22 5:29:23

Test Laboratory: SGS Testing Korea
File Name: WCDMA V.da4

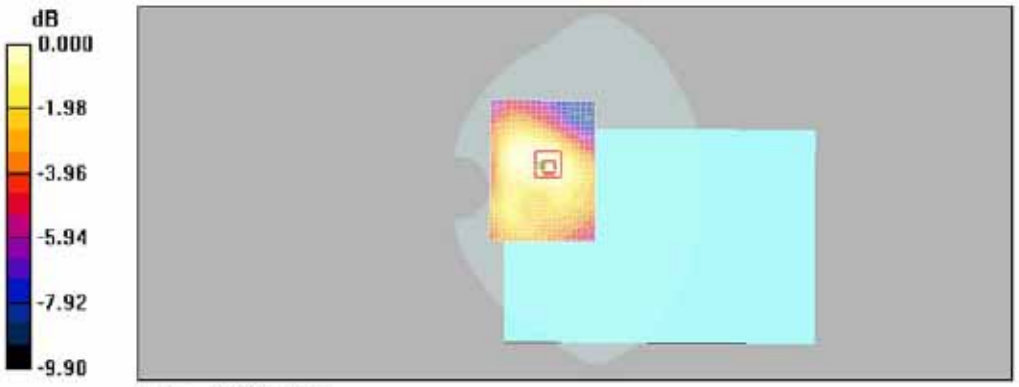
DUT: LGX12; Type: Notebook PC; Serial: N/A
Program Name: WCDMA V

Communication System: WCDMA V; Frequency: 826.4 MHz;Duty Cycle: 1:1
Medium parameters used: f = 826.5 MHz; σ = 0.963 mho/m; ε_r = 54; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1783; ConvF(5.89, 5.89, 5.89); Calibrated: 2008-11-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2008-09-24
- Phantom: SAM MIC #2000-93 with CRP_900MHz; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

HSUPA_Body_Low/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.029 mW/g

HSUPA_Body_Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.41 V/m; Power Drift = -0.029 dB
Peak SAR (extrapolated) = 0.050 W/kg
SAR(1 g) = 0.028 mW/g; SAR(10 g) = 0.018 mW/g
Maximum value of SAR (measured) = 0.029 mW/g



0 dB = 0.029mW/g

Date/Time: 2009-04-22 5:55:06

Test Laboratory: SGS Testing Korea
File Name: WCDMA V.da4

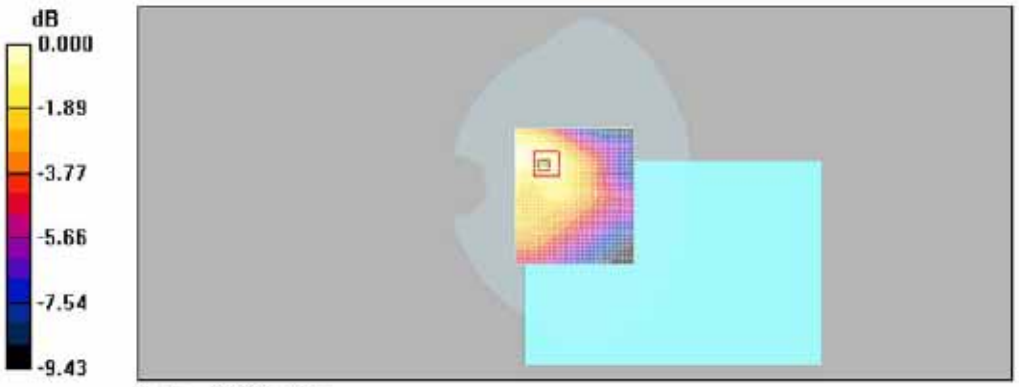
DUT: LGX12; Type: Notebook PC; Serial: N/A
Program Name: WCDMA V

Communication System: WCDMA V; Frequency: 826.4 MHz;Duty Cycle: 1:1
Medium parameters used: f = 826.5 MHz; σ = 0.963 mho/m; ε_r = 54; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1783; ConvF(5.89, 5.89, 5.89); Calibrated: 2008-11-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2008-09-24
- Phantom: SAM MIC #2000-93 with CRP_900MHz; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

HSDPA_Body_Low/Area Scan (71x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.028 mW/g

HSDPA_Body_Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.46 V/m; Power Drift = -0.040 dB
Peak SAR (extrapolated) = 0.051 W/kg
SAR(1 g) = 0.028 mW/g; SAR(10 g) = 0.018 mW/g
Maximum value of SAR (measured) = 0.029 mW/g



0 dB = 0.029mW/g

WCDMA II Body SAR Test

Date/Time: 2009-04-23 3:19:36

Test Laboratory: SGS Testing Korea
File Name: WCDMA II.da4

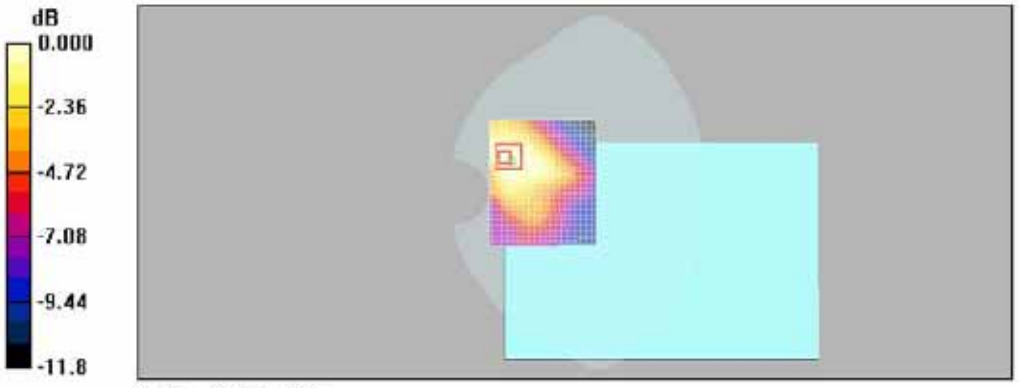
DUT: LGX12; Type: Notebook PC; Serial: N/A
Program Name: WCDMA II

Communication System: W-CDMA II; Frequency: 1852.4 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1852.4 MHz; σ = 1.49 mho/m; ε_r = 55.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1783; ConvF(4.63, 4.63, 4.63); Calibrated: 2008-11-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2008-09-24
- Phantom: SAM MIC #2000-93 with CRP; Type: SAM MIC #2000-93; Serial: TP-1299
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body_Low/Area Scan (61x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.044 mW/g

Body_Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.67 V/m; Power Drift = -0.002 dB
Peak SAR (extrapolated) = 0.081 W/kg
SAR(1 g) = 0.042 mW/g; SAR(10 g) = 0.027 mW/g
Maximum value of SAR (measured) = 0.044 mW/g



0 dB = 0.044mW/g

Date/Time: 2009-04-23 3:42:15

Test Laboratory: SGS Testing Korea
File Name: WCDMA II.da4

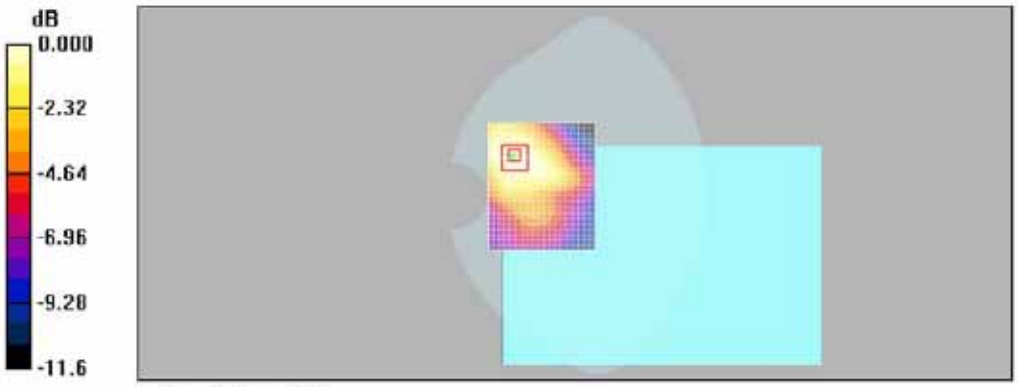
DUT: LGX12; Type: Notebook PC; Serial: N/A
Program Name: WCDMA II

Communication System: W-CDMA II; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.49 mho/m; ε_r = 55.6; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1783; ConvF(4.63, 4.63, 4.63); Calibrated: 2008-11-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2008-09-24
- Phantom: SAM MIC #2000-93 with CRP; Type: SAM MIC #2000-93; Serial: TP-1299
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body_Mid/Area Scan (61x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.038 mW/g

Body_Mid/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.41 V/m; Power Drift = 0.107 dB
Peak SAR (extrapolated) = 0.072 W/kg
SAR(1 g) = 0.036 mW/g; SAR(10 g) = 0.023 mW/g
Maximum value of SAR (measured) = 0.037 mW/g



0 dB = 0.037mW/g

Date/Time: 2009-04-23 4:11:07

Test Laboratory: SGS Testing Korea
File Name: WCDMA II.da4

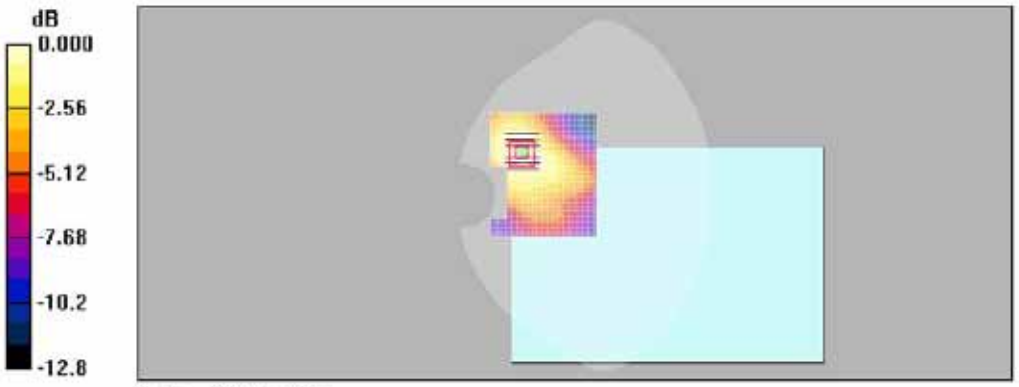
DUT: LGX12; Type: Notebook PC; Serial: N/A
Program Name: WCDMA II

Communication System: W-CDMA II; Frequency: 1907.6 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1908 MHz; σ = 1.52 mho/m; ε_r = 55.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1783; ConvF(4.63, 4.63, 4.63); Calibrated: 2008-11-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2008-09-24
- Phantom: SAM MIC #2000-93 with CRP; Type: SAM MIC #2000-93; Serial: TP-1299
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body_High/Area Scan (61x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.033 mW/g

Body_High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.27 V/m; Power Drift = 0.015 dB
Peak SAR (extrapolated) = 0.068 W/kg
SAR(1 g) = 0.032 mW/g; SAR(10 g) = 0.020 mW/g
Maximum value of SAR (measured) = 0.034 mW/g



0 dB = 0.034mW/g

Date/Time: 2009-04-23 4:35:04

Test Laboratory: SGS Testing Korea
File Name: WCDMA II.da4

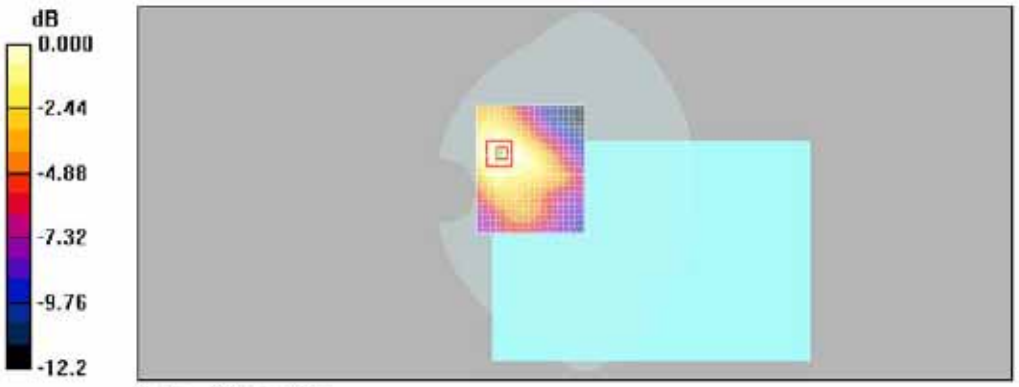
DUT: LGX12; Type: Notebook PC; Serial: N/A
Program Name: WCDMA II

Communication System: W-CDMA II; Frequency: 1852.4 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1852.4 MHz; σ = 1.49 mho/m; ε_r = 55.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1783; ConvF(4.63, 4.63, 4.63); Calibrated: 2008-11-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2008-09-24
- Phantom: SAM MIC #2000-93 with CRP; Type: SAM MIC #2000-93; Serial: TP-1299
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body_HSUPA_Low/Area Scan (61x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.044 mW/g

Body_HSUPA_Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.57 V/m; Power Drift = -0.065 dB
Peak SAR (extrapolated) = 0.091 W/kg
SAR(1 g) = 0.043 mW/g; SAR(10 g) = 0.027 mW/g
Maximum value of SAR (measured) = 0.045 mW/g



0 dB = 0.045mW/g

Date/Time: 2009-04-23 5:09:04

Test Laboratory: SGS Testing Korea
File Name: WCDMA II.da4

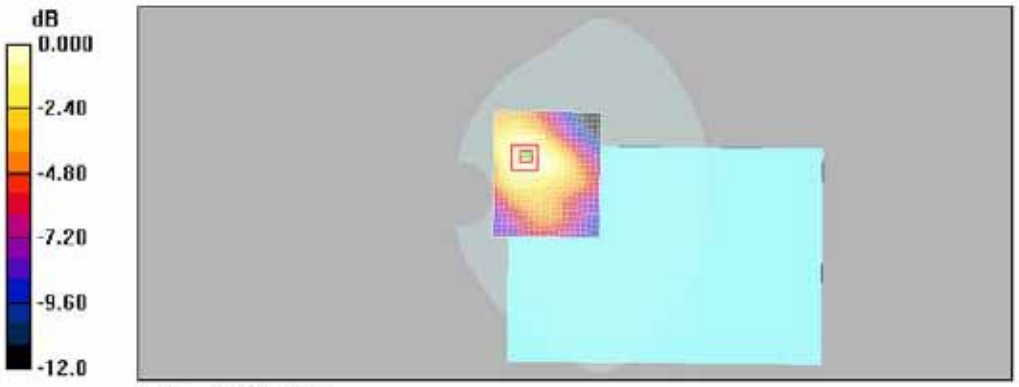
DUT: LGX12; Type: Notebook PC; Serial: N/A
Program Name: WCDMA II

Communication System: W-CDMA II; Frequency: 1852.4 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 1852.4 MHz; σ = 1.49 mho/m; ε_r = 55.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1783; ConvF(4.63, 4.63, 4.63); Calibrated: 2008-11-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2008-09-24
- Phantom: SAM MIC #2000-93 with CRP; Type: SAM MIC #2000-93; Serial: TP-1299
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body_HSDPA_Low/Area Scan (61x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.047 mW/g

Body_HSDPA_Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.75 V/m; Power Drift = -0.001 dB
Peak SAR (extrapolated) = 0.093 W/kg
SAR(1 g) = 0.046 mW/g; SAR(10 g) = 0.028 mW/g
Maximum value of SAR (measured) = 0.048 mW/g



0 dB = 0.048mW/g

Appendix C

Uncertainty Analysis

Uncertainty of SAR equipments for measurement

Items	Uncertainty value %	Probability Distribution	Divisor	ci 1 1g	Standard unc (1g)	vi or Veff
Measurement System						
Probe calibration	4.8	normal	1	1	4.8%	∞
Axial isotropy	4.7	rectangular	√ 3	$(1-c_p)^{1/2}$	1.9%	∞
Hemispherical isotropy	9.6	rectangular	√ 3	$(c_p)^{1/2}$	3.9%	∞
Boundary effects	1.0	rectangular	√ 3	1	0.6%	∞
Linearity	4.7	rectangular	√ 3	1	2.7%	∞
System Detection limits	1.0	rectangular	√ 3	1	0.6%	∞
Readout Electronics	1.0	normal	1	1	1.0%	∞
Response time	0.8	rectangular	√ 3	1	0.5%	∞
Integration time	2.6	rectangular	√ 3	1	1.5%	∞
RF Ambient Conditions	3.0	rectangular	√ 3	1	1.7%	∞
Mech. constrains of robot	0.4	rectangular	√ 3	1	0.2%	∞
Probe positioning	2.9	rectangular	√ 3	1	1.7%	∞
Extrap. and integration	1.0	rectangular	√ 3	1	0.6%	∞

Uncertainty of measurements

Test Sample Related						
Device positioning	2.9	normal	1	1	2.9%	145
Device holder uncertainty	3.6	normal	1	1	3.6%	5
Power drift	5.0	rectangular	√ 3	1	2.9%	∞
Phantom and Setup						
Phantom uncertainty	4.0	rectangular	√ 3	1	2.3%	∞
Liquid conductivity(target)	5.0	rectangular	√ 3	0.64	1.8%	∞
Liquid conductivity(meas.)	2.5	normal	1	0.64	1.6%	∞
Liquid permittivity(target)	5.0	rectangular	√ 3	0.6	1.7%	∞
Liquid permittivity(meas.)	2.5	normal	1	0.6	1.5%	∞

Uncertainty of SAR system

Combined Standard Uncertainty				10.3%	
Expanded Standard Uncertainty(k=2)				20.6%	

Appendix D

Calibration Certificate

- **PROBE**
- **DAE**
- **835 MHz, 1900 MHz DIPOLE**

- PROBE Calibration Certificate

Schmid & Partner Engineering AG
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Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

s p e a g

Additional Conversion Factors
for Dosimetric E-Field Probe

Type:	**ET3DV6**
Serial Number:	**1783**
Place of Assessment:	**Zurich**
Date of Assessment:	**April 9, 2009**
Probe Calibration Date:	**November 14, 2008**

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 900 MHz or at 1810 MHz.

Assessed by:

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Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

Dosimetric E-Field Probe ET3DV6 - SN:1783

Conversion factor (± standard deviation)

835 ± 50 MHz	*ConvF*	6.13 ± 7%	ε_r = 41.5 ± 5% σ = 0.90 ± 5% mho/m (head tissue)
1900 ± 50 MHz	*ConvF*	4.92 ± 7%	ε_r = 40.0 ± 5% σ = 1.40 ± 5% mho/m (head tissue)
835 ± 50 MHz	*ConvF*	5.89 ± 7%	ε_r = 55.2 ± 5% σ = 0.97 ± 5% mho/m (body tissue)
1900 ± 50 MHz	*ConvF*	4.63 ± 7%	ε_r = 53.3 ± 5% σ = 1.52 ± 5% mho/m (body tissue)

Important Note:

For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.

Please see also Section 4.7 of the DASY4 Manual.

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Accreditation No.: SCS 108

Client SGS (Dymstec)

Certificate No: ET3-1783_Nov08

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN:1783
Calibration procedure(s)	QA CAL-01.v6 and QA CAL-23.v3 Calibration procedure for dosimetric E-field probes
Calibration date:	November 14, 2008
Condition of the calibrated item	In Tolerance

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	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41495277	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41498087	1-Apr-08 (No. 217-00788)	Apr-09
Reference 3 dB Attenuator	SN: S5054 (3c)	1-Jul-08 (No. 217-00865)	Jul-09
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-08 (No. 217-00787)	Apr-09
Reference 30 dB Attenuator	SN: S5129 (30b)	1-Jul-08 (No. 217-00866)	Jul-09
Reference Probe ES3DV2	SN: 3013	2-Jan-08 (No. ES3-3013_Jan08)	Jan-09
DAE4	SN: 660	9-Sep-08 (No. DAE4-660_Sep08)	Sep-09

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-08)	In house check: Oct-09

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: November 14, 2008

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Accreditation No.: SCS 108

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Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
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 effect 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 (no uncertainty required). DCP does not depend on frequency nor media.
- *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 ET3DV6

SN:1783

Manufactured:	April 15, 2003
Last calibrated:	November 19, 2007
Recalibrated:	November 14, 2008

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1783 November 14, 2008

DASY - Parameters of Probe: ET3DV6 SN:1783

Sensitivity in Free Space[A] Diode Compression[B]

NormX	1.94 ± 10.1%	μV/(V/m)²	DCP X	92 mV
NormY	1.36 ± 10.1%	μV/(V/m)²	DCP Y	91 mV
NormZ	1.73 ± 10.1%	μV/(V/m)²	DCP Z	93 mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL 900 MHz Typical SAR gradient: 5 % per mm

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR_{be} [%]	Without Correction Algorithm	9.1	5.2
SAR_{be} [%]	With Correction Algorithm	0.9	0.5

TSL 1810 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR_{be} [%]	Without Correction Algorithm	10.0	5.9
SAR_{be} [%]	With Correction Algorithm	0.8	0.4

Sensor Offset

Probe Tip to Sensor Center	2.7 mm

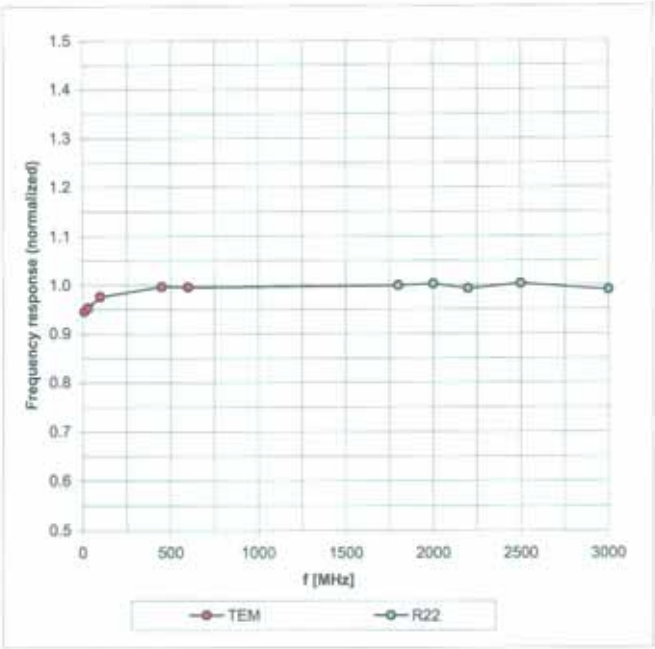
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 8).
[B] Numerical linearization parameter: uncertainty not required.

ET3DV6 SN:1783 November 14, 2008

Frequency Response of E-Field

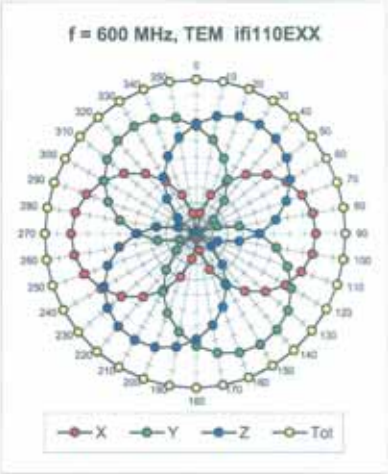
(TEM-Cell:ifi110 EXX, Waveguide: R22)

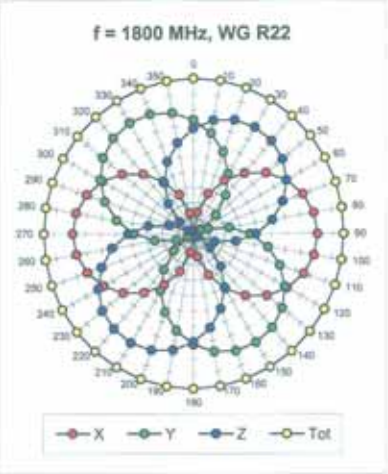


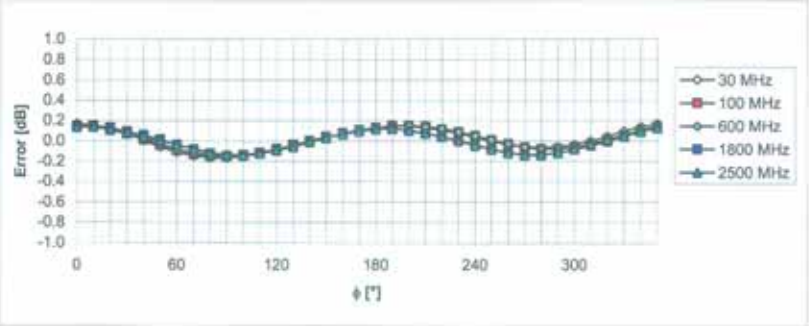
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

ET3DV6 SN:1783 November 14, 2008

Receiving Pattern (ϕ), ϑ = 0°





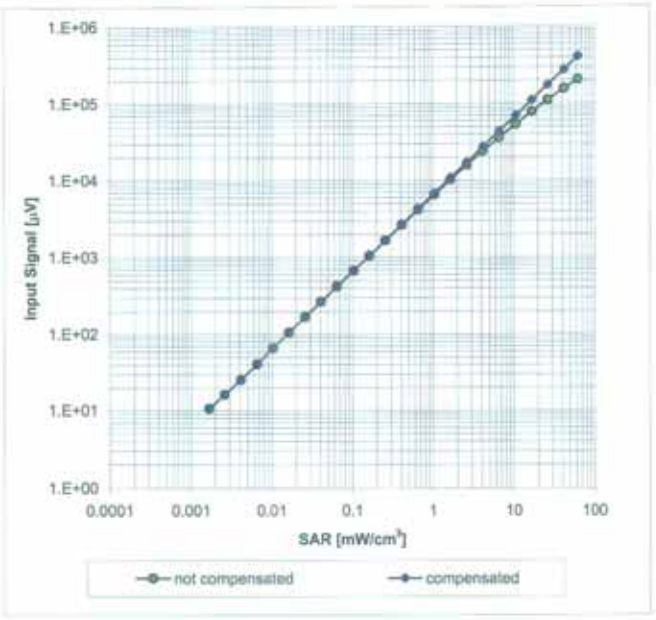


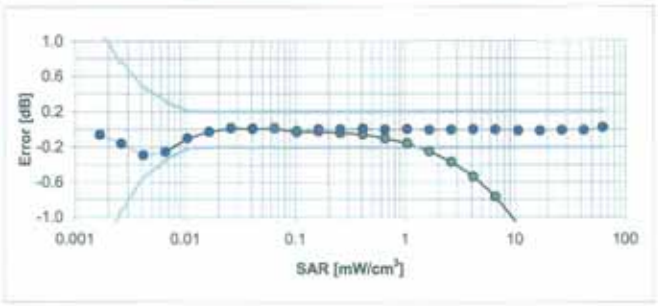
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

ET3DV6 SN:1783 November 14, 2008

Dynamic Range f(SAR_{head})

(Waveguide R22, f = 1800 MHz)

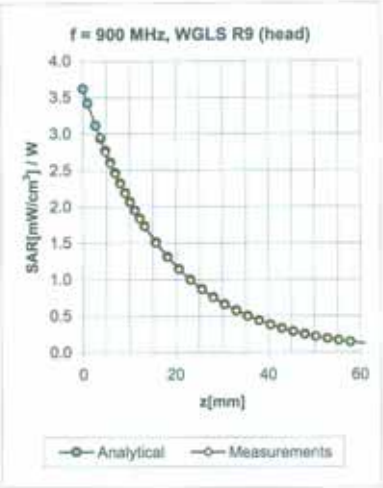


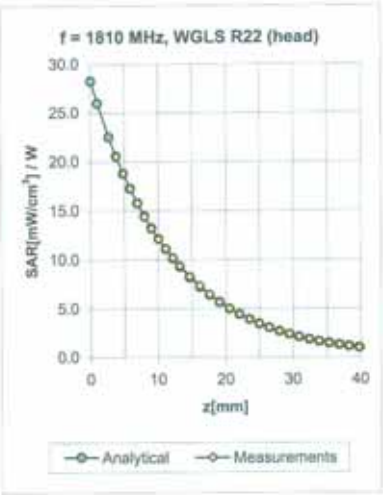


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

ET3DV6 SN:1783 November 14, 2008

Conversion Factor Assessment





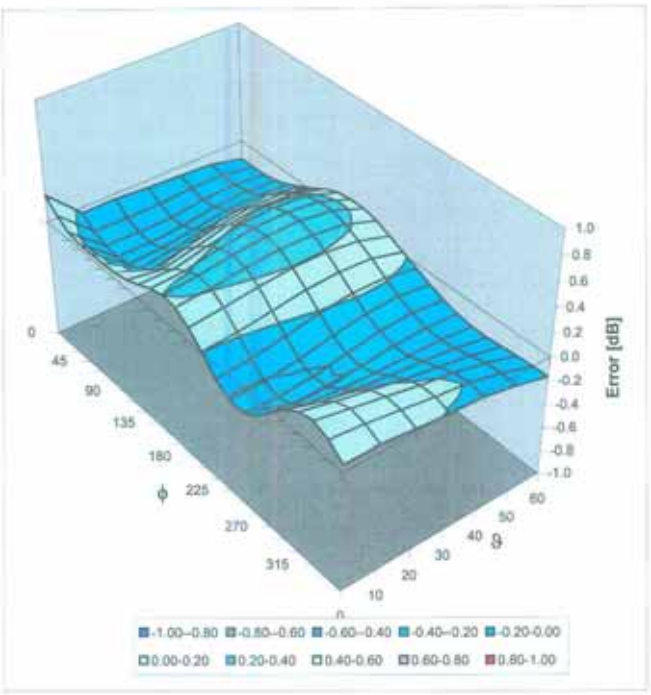
f [MHz]	Validity [MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.25	3.19	5.97 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.96	1.79	5.03 ± 11.0% (k=2)

[C] The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

ET3DV6 SN:1783 November 14, 2008

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

-DAE Calibration Certificate

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Accreditation No.: SCS 108

Client SGS (Dymstec)

Certificate No: DAE3-567_Sep08

CALIBRATION CERTIFICATE

Object	DAE3 - SD 000 D03 AA - SN: 567
Calibration procedure(s)	QA CAL-06.v12 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	September 24, 2008
Condition of the calibrated item	In Tolerance

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
Fluke Process Calibrator Type 702	SN: 6295803	04-Oct-07 (No: 6467)	Oct-08
Keithley Multimeter Type 2001	SN: 0810278	03-Oct-07 (No: 6465)	Oct-08
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Calibrator Box V1.1	SE UMS 006 AB 1004	06-Jun-08 (in house check)	In house check: Jun-09

	Name	Function	Signature
Calibrated by:	Dominique Steffen	Technician	
Approved by:	Fin Bomholt	R&D Director	

Issued: September 24, 2008

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Accreditation No.: SCS 108

Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range:	1LSB =	6.1μV ,	full range =	-100...+300 mV
Low Range:	1LSB =	61nV ,	full range =	-1.....+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.676 ± 0.1% (k=2)	404.415 ± 0.1% (k=2)	404.505 ± 0.1% (k=2)
Low Range	3.95084 ± 0.7% (k=2)	3.95932 ± 0.7% (k=2)	3.95189 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	85 ° ± 1 °

Appendix

1. DC Voltage Linearity

High Range		Input (μV)	Reading (μV)	Error (%)
Channel X	+ Input	200000	200000.4	0.00
Channel X	+ Input	20000	20004.42	0.02
Channel X	- Input	20000	-19999.98	0.00
Channel Y	+ Input	200000	200000	0.00
Channel Y	+ Input	20000	20003.82	0.02
Channel Y	- Input	20000	-20001.54	0.01
Channel Z	+ Input	200000	200000.2	0.00
Channel Z	+ Input	20000	20001.02	0.01
Channel Z	- Input	20000	-20001.77	0.01

Low Range		Input (μV)	Reading (μV)	Error (%)
Channel X	+ Input	2000	2000.1	0.00
Channel X	+ Input	200	200.08	0.04
Channel X	- Input	200	-200.46	0.23
Channel Y	+ Input	2000	2000.1	0.00
Channel Y	+ Input	200	199.44	-0.28
Channel Y	- Input	200	-200.67	0.33
Channel Z	+ Input	2000	1999.9	0.00
Channel Z	+ Input	200	198.93	-0.53
Channel Z	- Input	200	-201.01	0.50

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	4.45	3.07
	- 200	-1.97	-3.12
Channel Y	200	0.63	0.75
	- 200	-1.46	-2.02
Channel Z	200	5.71	5.24
	- 200	-6.82	-7.33

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	1.58	0.47
Channel Y	200	0.86	-	2.06
Channel Z	200	-2.64	0.26	-

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	16354	16104
Channel Y	16145	17163
Channel Z	15912	15586

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	-0.07	-1.16	0.99	0.42
Channel Y	-0.59	-1.54	0.25	0.31
Channel Z	-0.69	-1.63	0.02	0.32

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance

	Zeroing (MOhm)	Measuring (MOhm)
Channel X	0.2001	201.2
Channel Y	0.2001	200.7
Channel Z	0.2001	199.3

8. Low Battery Alarm Voltage (verified during pre test)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (verified during pre test)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.0	+6	+14
Supply (- Vcc)	-0.01	-8	-9

- 835 MHz Dipole Calibration Certificate

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Accreditation No.: SCS 108

Client SGS KES (Dymstec)

Certificate No: D835V2-490_Aug07

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 490
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	August 27, 2007
Condition of the calibrated item	In Tolerance

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	03-Oct-06 (METAS, No. 217-00608)	Oct-07
Power sensor HP 8481A	US37292783	03-Oct-06 (METAS, No. 217-00608)	Oct-07
Reference 20 dB Attenuator	SN: 5086 (20g)	07-Aug-07 (METAS, No 217-00718)	Aug-08
Reference 10 dB Attenuator	SN: 5047.2 (10r)	07-Aug-07 (METAS, No 217-00718)	Aug-08
Reference Probe ET3DV6 (HF)	SN 1507	19-Oct-06 (SPEAG, No. ET3-1507_Oct06)	Oct-07
DAE4	SN 601	30-Jan-07 (SPEAG, No. DAE4-601_Jan07)	Jan-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-05)	In house check: Oct-07
RF generator Agilent E4421B	MY41000675	11-May-05 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Oct-06)	In house check: Oct-07

	Name	Function	Signature
Calibrated by:	Mike Meili	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 29, 2007

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Accreditation No.: **SCS 108**

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 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.

Measurement Conditions

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

DASY Version	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
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	40.3 ± 6 %	0.88 mho/m ± 6 %
Head TSL temperature during test	(22.8 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.27 mW / g
SAR normalized	normalized to 1W	9.08 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**9.05 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.49 mW / g
SAR normalized	normalized to 1W	5.96 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**5.93 mW / g ± 16.5 % (k=2)**

[1] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.9 Ω - 4.0 jΩ
Return Loss	- 27.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.380 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	May 19, 2003

DASY4 Validation Report for Head TSL

Date/Time: 27.08.2007 13:05:22

Test Laboratory: SPEAG, Zurich, Switzerland

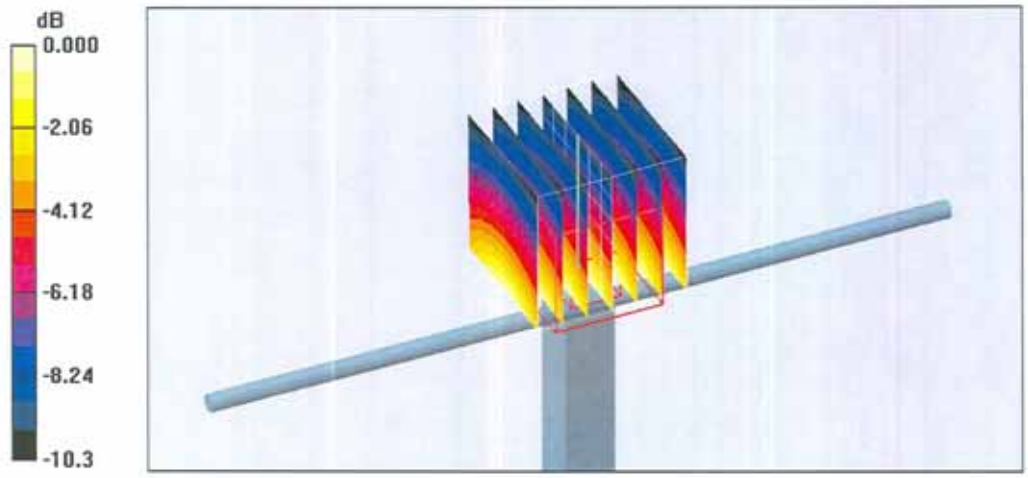
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:490

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL 900 MHz;
Medium parameters used: f = 835 MHz; σ = 0.881 mho/m; ε_r = 40.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

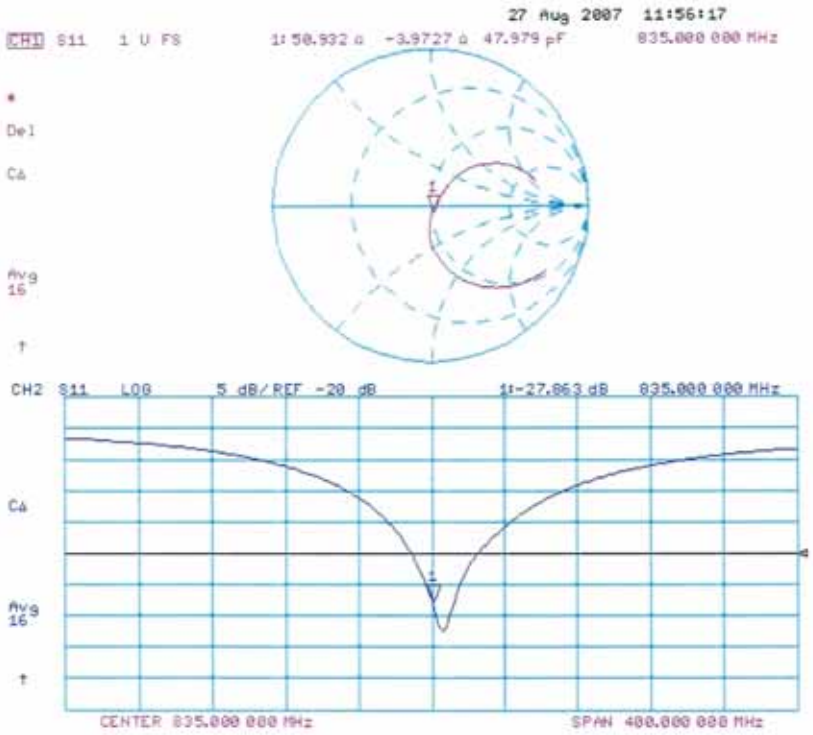
- Probe: ET3DV6 - SN1507 (HF); ConvF(6.09, 6.09, 6.09); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.4 V/m; Power Drift = -0.041 dB
Peak SAR (extrapolated) = 3.26 W/kg
SAR(1 g) = 2.27 mW/g; SAR(10 g) = 1.49 mW/g
Maximum value of SAR (measured) = 2.45 mW/g



0 dB = 2.45mW/g

Impedance Measurement Plot for Head TSL



- 1900 MHz Dipole Calibration Certificate

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Accreditation No.: SCS 108

Client **SGS KES (Dymstec)**

Certificate No: D1900V2-5d033_Aug07

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d033
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	August 28, 2007
Condition of the calibrated item	In Tolerance

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	03-Oct-06 (METAS, No. 217-00606)	Oct-07
Power sensor HP 8481A	US37292783	03-Oct-06 (METAS, No. 217-00606)	Oct-07
Reference 20 dB Attenuator	SN: 5086 (20g)	07-Aug-07 (METAS, No 217-00718)	Aug-08
Reference 10 dB Attenuator	SN: 5047.2 (10r)	07-Aug-07 (METAS, No 217-00718)	Aug-08
Reference Probe ET3DV6	SN: 1507	19-Oct-06 (SPEAG, No. ET3-1507_Oct06)	Oct-07
Reference Probe ES3DV3	SN: 3025	19-Oct-06 (SPEAG, No. ES3-3025_Oct06)	Oct-07
DAE4	SN 601	30-Jan-07 (SPEAG, No. DAE4-601_Jan07)	Jan-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-05)	In house check: Oct-07
RF generator Agilent E4421B	MY41000675	11-May-05 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Oct-06)	In house check: Oct-07

	Name	Function	Signature
Calibrated by:	Marcel Fehr	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 29, 2007

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Accreditation No.: SCS 108

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 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.

Measurement Conditions

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

DASY Version	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
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	39.3 ± 6 %	1.47 mho/m ± 6 %
Head TSL temperature during test	(21.3 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	condition	
SAR measured	250 mW input power	9.39 mW / g
SAR normalized	normalized to 1W	37.6 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**36.3 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	4.93 mW / g
SAR normalized	normalized to 1W	19.7 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**19.4 mW / g ± 16.5 % (k=2)**

[1] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.8 Ω + 4.7 jΩ
Return Loss	- 24.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.205 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 17, 2003

DASY4 Validation Report for Head TSL

Date/Time: 28.08.2007 14:28:53

Test Laboratory: SPEAG, Zurich, Switzerland

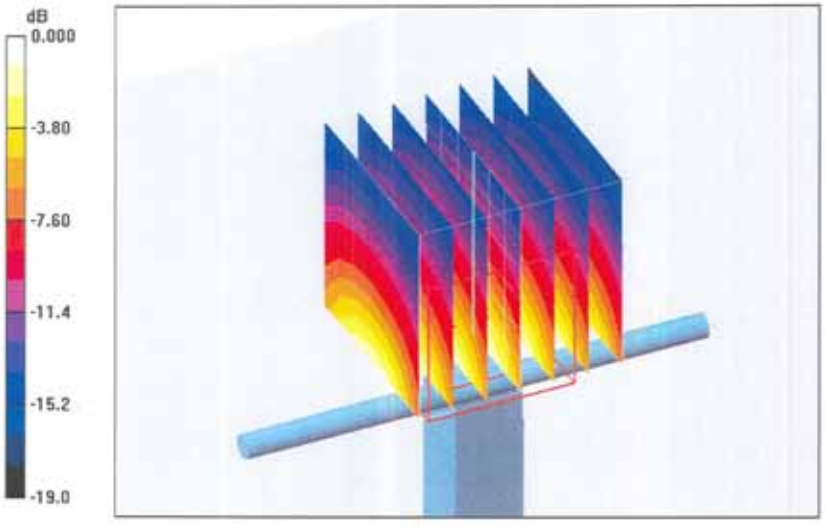
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d033

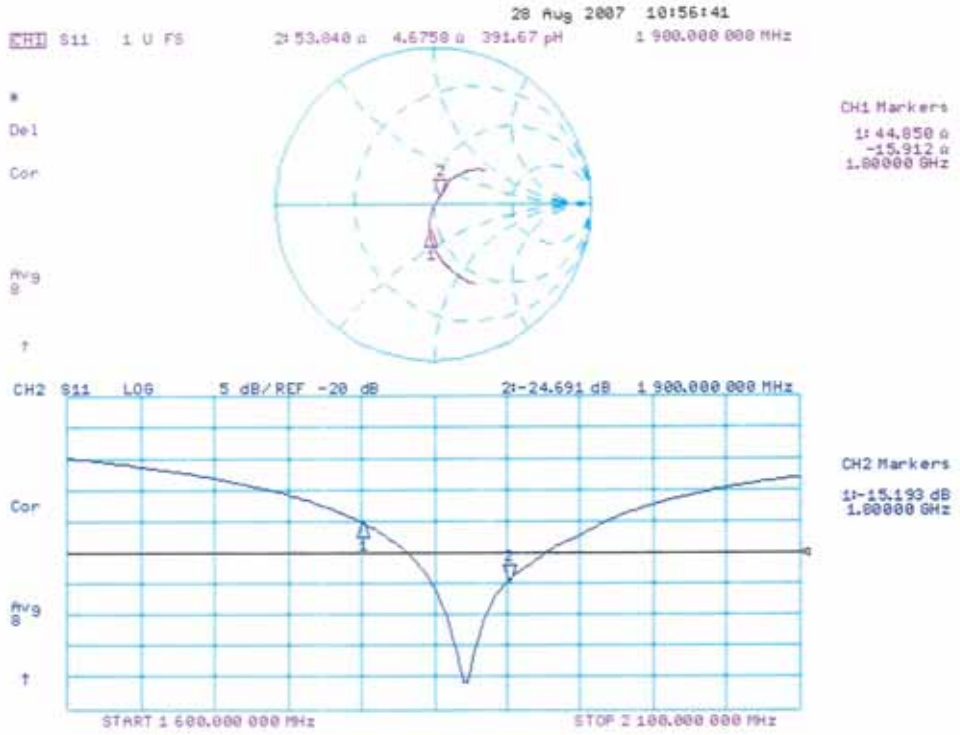
Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: HSL U10 BB;
Medium parameters used: f = 1900 MHz; σ = 1.47 mho/m; ε_r = 39.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.97, 4.97, 4.97); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.7 V/m; Power Drift = 0.006 dB
Peak SAR (extrapolated) = 16.1 W/kg
SAR(1 g) = 9.39 mW/g; SAR(10 g) = 4.93 mW/g
Maximum value of SAR (measured) = 10.7 mW/g



0 dB = 10.7mW/g

Impedance Measurement Plot for Head TSL