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SAR TEST REPORT

Equipment Under Test :	Notebook PC			
Model No. :	: E396			
Applicant :	Novatel Wireless			
Address of Applicant :	6715 8th Street N.E. Suite 200, Calgary, Alberta, Canada			
	T2E 7H7			
FCC ID :	A3LXE303C12 + Contain FCC ID: PKRNVWE396			
IC ID :	649E-XE303C12 + Contain IC ID: 3229B-E396			
Device Category :	Portable Device			
Exposure Category :	General Population / Uncontrolled Exposure			
Date of Receipt :	2012-08-21			
Date of Test(s) :	2012-10-10 ~ 2012-10-14			
Date of Issue :	2012-11-08			
Max. SAR :	0.004 W/kg (DCN. CDMA), 0.007 W/kg (PCS. CDMA),			
	0.011 W/kg (WLAN_2.4 GHz), 0.022 W/kg (WLAN_5.2 GHz)			
	0.022 W/kg (WLAN_5.3 GHz), 0.021 W/kg (WLAN_5.5 GHz)			
	0.031 W/kg (WLAN_5.8 GHz)			

FCC OET Bulletin 65 supplement C RSS-102 (Issue 4) IEEE 1528, 2003 ANSI/IEEE C95.1, C95.3

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

Remarks:

Standards:

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 Korea Co., Ltd. (Gunpo Laboratory) or testing done by SGS Korea Co., Ltd. (Gunpo Laboratory) in connection with distribution or use of the product described in this report must be approved by SGS Korea Co., Ltd. (Gunpo Laboratory) in writing.

Tested by	: Minh	yuk Han	A	2012-11-08
Approved by	: Feel J	leong	3	2012-11-08
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APPENDIX

2. 3.

- A. DASY4 SAR Report
- B. Uncertainty Analysis
- C. Calibration certificate



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1. General Information

1.1 Testing Laboratory

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: +82 +31 427 2371
: All SGS services are rendered in accordance with the applicable SGS conditions
of service available on request and accessible at <u>http://www.sgs.com/en/Terms-</u>
and-Conditions.aspx

1.2 Details of Applicant

Applicant: Novatel WirelessAddress: 6715 8th Street N.E. Suite 200, Calgary, Alberta, Canada T2E 7H7

1.3 Version of Report

Version Number	Date	Revision
00	2012-10-19	Initial issue
01	2012-11-08	Revision 01

1.4 Description of EUT(s)

EUT Type	Notebook PC		
Model	E396		
FCC ID	A3LXE303C12 + Contain FCC ID: PKRNVWE396		
IC ID	649E-XE303C12 + Contain IC ID: 3229B-E396		
Serial Number	HWG591WC700015E		
Mode of Operation	CDMA, WLAN		
Duty Cycle	1(CDMA, WLAN)		
Body worn Accessory	None		
	824.70 Mz ~ 848.31 Mz (DCN. CDMA/EVDE)		
	1851.25 Mz ~ 1908.75 Mz (PCS. CDMA/EVDO)		
	2412 MHz~ 2462 MHz (WLAN_11b/g/n)		
Tx Frequency Range	5180 MHz ~ 5240 MHz, 5260 MHz ~ 5320 MHz (WLAN_11a/n)		
	5500 MHz ~ 5700 MHz, 5745 MHz ~ 5825 MHz (WLAN_11a/n)		
	2402 MHz ~ 2480 MHz (Bluetooth)		
	24.57 dB m (DCN. CDMA), 24.38 dB m (PCS. CDMA)		
	16.39 dB m (WLAN_2.4 GHz), 11.74 dB m (WLAN_5.2 GHz)		
Conducted Max Power	11.94 dB m (WLAN_5.3 GHz), 15.56 dB m (WLAN_5.5 GHz)		
	13.78 dB m (WLAN_5.8 GHz), 0.94 dB m (Bluetooth)		

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1.5 Test Environment

Ambient temperature	(22 ± 2) ° C
Tissue Simulating Liquid	$: (22 \pm 2) \circ C$
Relative Humidity	: (55 ± 5) % R.H.

1.6 Operation Configuration

The client provided a special driver and test program which can control the frequency and power of the WLAN. 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.

1.7 Host PC Information

Model Name	E396
Serial No.	HWG591WC700015E
Manufacturer	Novatel Wireless

1.8 SAR Measurement Procedures

Step 1: Power Reference Measurement

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 2.1 mm. This distance cannot be smaller than the Distance of sensor calibration points to probe tip as defined in the probe properties.

Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE Standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.



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Step 3: Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures 7x7x9 (above 4.5 GHz) or 5x5x7 (below 3 GHz) points within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

Step 4: Power drift measurement

The Power Drift Measurement measures the field at the same location as the most recent power reference measurement within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

Step 5: Z-Scan

The Z Scan measures points along a vertical straight line. The line runs along the Z-axis of a onedimensional grid. In order to get a reasonable extrapolation, the extrapolated distance should not be larger than the step size in Z-direction.

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/Ex3DV4 3791 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, ADconversion, 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.



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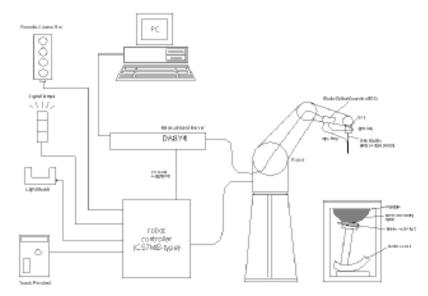


Fig a. The microwave circuit arrangement used for SAR system verification

• 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 ELI 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.



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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 Mz to 2.5 Gz In brain simulating tissue
	$(accuracy \pm 8 \%)$
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	: $5 \mu W/g$ to >100 mW/g; Linearity: ± 0.2 dB
Range	
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

EX3DV4 E-Field Probe

Construction	: Symmetrical design with triangular core. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	 Basic Broad Band Calibration in air Conversion Factors (CF) for HSL 2600 and HSL5800. Additional CF-Calibration for other liquids and frequencies upon request.
Frequency	: 10 MHz to 6 GHz; Linearity: ± 0.2 dB (30 MHz to 6 GHz)
Directivity	: ± 0.3 dB in HSL (rotation around probe axis)
Dynamic Range	 ± 0.5 dB in tissue material (rotation normal to probe axis) : 10μW/g to > 100 m W/g; Linearity: ± 0.2 dB(noise: typically < 1 μW/g)
Dimensions	: Overall length: 337 mm (Tip length: 20 mm) Tip diameter: 2.5 mm (Body diameter: 12 mm) Distance from probe tip to dipole centers: 1 mm
Application	: High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%



EX3DV4 E-Field Probe

NOTE:

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

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ELI Phantom

Construction:

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Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 Mb to 6 Gbz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.

ELI V5.0 has the same shell geometry and is manufactured from the same material as ELI4, but has reinforced top structure



ELI Phantom

Shell Thickness: $2.0 \text{ mm} \pm 0.2 \text{ mm}$

Dimensions Major axis: 600 mm Minor axis: 400 mm

DEVICE HOLDER

Construction Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices according to IEC 62209-2 (a.q.. laptops, Cameras, etc.). It is lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioned.



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 \pm 10 % from the target SAR values. These tests were done at 835 MHz, 1900 MHz, 2450 MHz, 5200 MHz, 5500 MHz and 5800 MHz. 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 (22 ± 2) ° C, the relative



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humidity was in the range (55 ± 5) % R.H. 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.

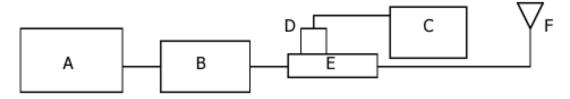


Fig b. The microwave circuit arrangement used for SAR system verification

- A. Agilent Model E4421B Signal Generator
- B. EMPOWER Model (2001-BBS3Q7ECK),
 - (2057-BBS3Q5KCK) Amplifier
- C. Agilent Model E4419B Power Meter
- D. Agilent Model 9300H Power Sensor
- E. Agilent Model 778D/86205A Dual directional coupler
- F. Reference dipole Antenna



Photo of the dipole Antenna

Dys	seem vanua	non Results					
Validation Kit	Tissue	Target SAR 1 g from Calibration Certificate (1 W)	Measured SAR 1 g (0.1 W)	Measured SAR 1 g (1 W)	Deviation (%)	Date	Liquid Temp. (°C)
D835V2 S/N: 490	835 MHz Body	9.35 W/kg	0.918 W /kg	9.18 W/kg	-1.81	2012-10-16	22.0
D1900V2 S/N: 5d033	1900 MHz Body	39.9 W /kg	3.86 W /kg	38.6 W/kg	-3.26	2012-10-17	22.9
D2450V2 S/N: 734	2450 Mtz Body	50.2 W/kg	5.12 W/kg	51.2 W/kg	1.99	2012-10-10	22.2
D5 GHz V2 S/N: 1023	5200 MHz Body	75.1 W/kg	7.96 W /kg	79.6 W/kg	5.99	2012-10-11	22.8
D5 GHz V2 S/N: 1023	5200 MHz Body	75.1 W/kg	7.86 W /kg	78.6 W/kg	4.66	2012-10-12	22.9
D5 GHz V2 S/N: 1106	5500 M⊮z Body	78.7 W/kg	8.15 W/kg	81.5 W/kg	3.56	2012-10-13	22.2
D5 GHz V2 S/N: 1106	5800 MHz Body	74.7 W/kg	7.71 W /kg	77.1 W/kg	3.21	2012-10-14	22.7

System Validation Results

Table 1. Results system validation

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1.12 Tissue Simulant Fluid for the Frequency Band

The dielectric properties for this simulant fluid were measured by using the Agilent Model 85070B Dielectric Probe (rates frequence band 200 MHz to 20 GHz) in conjunction with Agilent E5071B Network Analyzer (300 kHz - 6 GHz) by using a procedure detailed in Section V.

	Tissue		Dielectric Parameters			
f(Mb)	type	Limits / Measured	Permittivity	Conductivity	Simulated Tissue Temp(°C)	
		Measured, 2012-10-16	56.0	0.97	22.0	
835		Recommended Limits	55.2	0.97	21.0 ~ 23.0	
		Deviation(%)	<u>1.45</u>	<u>0.00</u>	-	
824	Body	Measured, 2012-10-16	56.1	0.96	22.0	
824		Deviation(%)	1.63	-1.03	-	
848		Measured, 2012-10-16	55.9	0.98	22.0	
040		Deviation(%)	<u>1.27</u>	<u>1.03</u>	-	
		Measured, 2012-10-17	54.1	1.52	22.7	
1880		Recommended Limits	53.3	1.52	21.0 ~ 23.0	
		Deviation(%)	<u>1.50</u>	<u>0.00</u>	-	
1051	Body	Measured, 2012-10-17	54.30	1.46	22.7	
1851		Deviation(%)	1.88	-3.95	-	
1908]	Measured, 2012-10-17	54.1	1.54	22.7	
1908		Deviation(%)	<u>1.50</u>	<u>1.32</u>	-	
		Measured, 2012-10-10	51.9	1.99	22.2	
2450		Recommended Limits	52.7	1.95	21.0 ~ 23.0	
		Deviation(%)	-1.52	<u>2.05</u>	-	
2412	Body	Measured, 2012-10-10	52.04	1.93	22.2	
2412		Deviation(%)	-1.25	<u>-1.03</u>	-	
2462] [Measured, 2012-10-10	51.91	2.01	22.2	
2402		Deviation(%)	<u>-1.5</u>	<u>3.08</u>	-	
		Measured, 2012-10-11	48.4	5.29	22.8	
5200		Recommended Limits	49	5.3	21.0 ~ 23.0	
		Deviation(%)	<u>-1.22</u>	<u>-0.19</u>	-	
5100	Body	Measured, 2012-10-11	48.54	5.25	22.8	
5180		Deviation(%)	-0.94	-0.94	-	
5220] [Measured, 2012-10-11	48.19	5.44	22.8	
5320		Deviation(%)	-1.65	2.64	-	



		Measured, 2012-10-12	50.2	5.37	22.9	
5200		Recommended Limits	49	5.3	21.0 ~ 23.0	
		Deviation(%)	2.45	1.32	-	
5 100	Body	Measured, 2012-10-12	50.2	5.34	22.9	
5180		Deviation(%)	<u>2.45</u>	0.75	-	
5220		Measured, 2012-10-12	50.02	5.32	22.9	
5320		Deviation(%)	<u>2.08</u>	0.38	-	
		Measured, 2012-10-13	48.3	5.51	22.2	
5500		Recommended Limits	48.6	5.65	21.0 ~ 23.0	
	Body	Deviation(%)	<u>-0.62</u>	-2.48	-	
5520		Measured, 2012-10-13	48.26	5.53	22.2	
5520		Deviation(%)	<u>-0.7</u>	-2.12	-	
		Measured, 2012-10-13	48.11	5.61	22.2	
5580	Body	Recommended Limits	48.5	5.77	21.0 ~ 23.0	
		Deviation(%)	<u>-0.8</u>	<u>-2.77</u>	-	
			Measured, 2012-10-13	48.16	5.64	22.2
5660		Recommended Limits	48.3	5.88	21.0 ~ 23.0	
		Deviation(%)	-0.29	<u>-4.08</u>	-	
5680	Body	Measured, 2012-10-13	47.96	5.72	22.2	
3080		Deviation(%)	<u>-0.7</u>	-2.72	-	
5700		Measured, 2012-10-13	47.96	5.77	22.2	
3700		Deviation(%)	<u>-0.7</u>	<u>-1.87</u>	-	
		Measured, 2012-10-14	47.7	5.93	22.7	
5800		Recommended Limits	48.2	6	21.0 ~ 23.0	
		Deviation(%)	<u>-1.04</u>	<u>-1.17</u>	-	
5745	Body	Measured, 2012-10-14	47.89	5.88	22.7	
3743		Deviation(%)	<u>-0.64</u>	<u>-2</u>	-	
5825		Measured, 2012-10-14	47.76	5.96	22.7	
3023		Deviation(%)	<u>-0.91</u>	<u>-0.67</u>	-	



The composition of the 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	Frequency (Mz)									
(% by weight)	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
Diethylenglycol monohexylether	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

required for fourne SAR evaluation.

Simulating Liquids for 5 GHz, Manufactured by SPEAG

Water	Mineral oil	Emulsifiers	Additives and Salt
78	11	9	2

Salt: 99 ⁺% Pure Sodium Chloride

Sugar: 98 ⁺% Pure Sucrose

Water: De-ionized, $16 \text{ M}\Omega^+$ 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



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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 .1)

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 .1 RF exposure limits



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2. Instruments List

Maunfacturer	Device	Туре	Serial Number	Due date of Calibration
Stäubli	Robot	RX90BL	F03/5W05A1/A/01	N/A
Schmid& Partner Engineering AG	Dosimetric E-Field Probe	ET3DV6	1782	April 27, 2013
Schmid& Partner Engineering AG	Dosimetric E-Field Probe	EX3DV4	3791	May 23, 2013
Schmid& Partner Engineering AG	835 Mz System Validation Dipole	D835V2	490	May 16, 2014
Schmid& Partner Engineering AG	1900 ₩z System Validation Dipole	D1900V2	5d033	May 23, 2014
Schmid& Partner Engineering AG	2450 ₩z System Validation Dipole	D2450V2	734	January 19, 2014
Schmid& Partner Engineering AG	5000 Mz System Validation Dipole	D5 GHz V2	1130	June 21, 2013
Schmid& Partner Engineering AG	Data acquisition Electronics	DAE3	567	January 20, 2013
Schmid& Partner Engineering AG	Software	DASY 4 V52.8.01	-	N/A
Schmid& Partner Engineering AG	Phantom	ELI 4.0	1169	N/A
Agilent	Network Analyzer	E5071C	MY46111535	July 3, 2013
Agilent	Dielectric Probe Kit	85070D	2184	N/A
Agilent	Power Meter	E4419B	GB43311125	July 01, 2013
Agilent	Power Sensor	E9300H	MY41495314 MY41495307	September 18, 2013 September 18, 2013
Agilent	Signal Generator	E4421B	MY42082477	March 29, 2013
Empower RF Systems	Power Amplifier	2001-BBS3Q7ECK	1032 D/C 0336	March 31, 2013
Empower RF Systems	Power Amplifier	BBS5K8CAJ	1010	September 17, 2013
Agilent	Directional RF Bridges	86205A	MY31402302	July 03, 2013
Microlab	LP Filter	LA-15N	N/A	September 14, 2013
Microlab	LP Filter	LA-30N	N/A	September 14, 2013
Microlab	LP Filter	LA-60N	N/A	September 14, 2013
Agilent	Attenuator	8491B	50566	September 14. 2013
R & S	Spectrum Analyzer	FSV30	100768	March 29, 2013

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3.Summary of Results

3.1 FCC Power Measurement Procedures

Power measurements were performed using a power meter under digital average mode.

In order to verify that the device was tested and maintained at full power, this was configured with the base station simulator. The SAR measurement Software calculates a reference point at the start and end of the test to check for power drifts. If conducted power deviations of more than 5 % occurred, the tests were repeated.

3.2 SAR Measurement Conditions for CDMA2000

The following procedures were performed according to FCC KDB Publication 941225 D01 "SAR Measurement Procedures for 3G Devices" v02, October 2007.

3.2.1 Output Power Verification

See 3GPP2 C.S0011/TIA-98-E as recommended by "SAR Measurement Procedures for 3G Devices" v02, October 2007. Maximum output power is verified on the High, Middle and Low channels according to procedures in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E. SO55 tests were measured with power control bits in the "All Up" condition.

- 1. If the mobile station (MS) supports Reverse TCH RC 1 and Forward TCH RC 1, set up a call using Fundamental Channel Test Mode 1 (RC=1/1) with 9600 bps data rate only.
- 2. Under RC1, C,S0011 Table 4.4.5.2-1, Table 2 parameters were applied.
- 3. If the MS supports the RC 3 Reverse FCH, RC3 Reverse SCH₀ and demodulation of RC 3,4, or 5, set up a call using Supplemental Channel Test Mode 3 (RC 3/3) with 9600 bps Fundamental Channel and 9600 bps SCH0 data rate.
- 4. Under RC3, C.S0011 Table 4.4.5.2-2, Table 3 was applied.
- 5. FCHs were configured at full rate for maximum SAR with "All Up" power control bits.

arameter	Units	Value
lor	dBm/1.23 MHz	-104
Pilot Ec	dB	-7
raffic E _c	dB	-7.4

Table .2

Parameters for Max. Power for RC3

Parameter	Units	Value
lot	dBm/1.23 MHz	-86
$\frac{\text{Pilot } E_{e}}{I_{or}}$	dB	+7
Traffic E _c	dB	-7,4

Table .3

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3.2.2 Body SAR Measurements for EVDO Data Devices

Hotspot Body SAR is measured using Subtype 0/1 physical Layer configurations for Rev. 0. SAR for Subtype 2 Physical layer configurations is not required for Rev. A when the maximum average output of each RF channels is less than that measured in Subtype 0/1 Physical layer configurations. Otherwise, SAR is measured on the maximum output channel for Rev. A using the exposure configuration that results in the highest SAR for the RF channels in REV. 0. The AT is tested with a Reverse Data Channel rate of 153.6 kbps in subtype 0/1 Physical Layer configuration; and a Reverse Data Channel payload size of 4096 bits and Termination Target of 16 slots in Subtype 2 Physical Layer configurations. Both FTAP and FETAP are configured with the ACK Channel transmitting in all slots. AT power control should be in "All Bits Up" conditions for TAP/ETAP.

SAR is not required for EVDO Rev. A when the maximum average output of each channel is less than 0.25 dB higher than output level tested with EVDO Rev.0.

3.3 RF Conducted Average Power

CDMA2000 1xRTT

Band	Channel	Frequency	TDSO SO32 [dBm}	TDSO SO32 [dBm}
		MHz	32 (+F-SCH)	32 (+SCH)
	1013	824.70	24.05	24.09
DCN	384	835.52	24.02	24.12
	777	848.31	23.92	24.01
	25	1851.25	24.24	24.20
PCS	600	1880.00	24.16	24.17
	1175	1908.75	23.97	24.01

CDMA2000 1xEVDO

			O Rev. 0 3m}	1x EVDO Rev. A [dBm}		
Band	Channel	FTAP Rate	RTAP Rate	FETAP Traffic Format	RETAP Data Payload Size	
Band		307.2 kbps (2 slot, QPSK)	153.6 kbps	307.2k, QPSK/ ACK channel is transmitted at all the slots	4096	
	1013	24.57	24.51	24.40	24.46	
DCN	384	24.45	24.36	24.33	24.38	
	777	24.29	24.19	24.26	24.26	
	25	24.24	24.29	24.25	24.28	
PCS	600	24.38	24.28	24.28	24.27	
	1175	24.10	24.05	24.06	24.00	

Note :

The modes with highest output power channel were chosen for the conducted output power measurement.

Please refer to original report (FCC ID: J9CGOBI3000) for Average Power information as documented in 07/29/2010 original filing.



WLAN

2.4 GHz

Mode	Freq.	Ch. #	Rate	Measure [dB	
With	(MHz)	Сп. т	Nau	Main	AUX
	2412	1	1	15.22	14.67
802.11b	2437	6	1	15.20	15.82
Γ	2462	11	1	14.84	16.78
	2412	1	6	14.33	14.12
802.11g	2437	6	6	13.34	14.18
Γ	2462	11	6	13.34	13.79
	2412	1	HT0	14.27	14.51
802.11n HT20	2437	6	HT0	14.12	14.37
11120	2462	11	HT0	14.01	13.85
	2422	3	HT7	13.87	14.22
802.11n HT40	2437	6	HT7	13.26	13.51
11140	2452	9	HT7	13.12	13.09
002.11	2412	1	HT8	13.69	13.41
802.11n HT20_MIMO	2437	6	HT8	13.54	13.79
	2462	11	HT8	13.33	13.27
002.11	2422	3	HT8	13.52	13.42
802.11n HT40_MIMO	2437	6	HT8	12.61	12.81
	2452	9	HT8	12.51	12.52

5.2 GHz

Mode	Freq.	Ch. #	Rate	Measured Power [dB m]	
	(MHz)			Main	AUX
	5180	36	6	12.11	11.43
802.11a	5200	40	6	11.42	11.32
802.11a	5220	44	6	11.69	10.57
	5240	48	6	11.29	10.08
	5180	36	HT0	11.12	10.21
802.11n	5200	40	HT0	10.65	10.12
HT20	5220	44	HT0	10.61	9.88
	5240	48	HT0	9.75	9.27
802.11n	5190	38	HT7	10.12	9.32
HT40	5230	46	HT7	9.51	8.80
	5180	36	HT8	10.28	9.82
802.11n	5200	40	HT8	10.23	9.52
HT20_MIMO	5220	44	HT8	9.77	9.32
	5240	48	HT8	9.52	8.81
802.11n	5190	38	HT8	9.35	8.65
HT40_MIMO	5230	46	HT8	8.76	8.15

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5.3 GHz

Mala	Freq.	C 1. #	Dete	Measured Power [dB m]	
Mode	(MHz)	Ch. #	Rate	Main	AUX
	5260	52	6	11.58	11.52
802 11-	5280	56	6	11.75	11.15
802.11a	5300	60	6	11.70	10.94
	5320	64	6	11.77	11.84
	5260	52	HT0	10.22	10.81
802.11n	5280	56	HT0	10.79	10.37
HT20	5300	60	HT0	10.29	10.32
	5320	64	HT0	10.85	10.25
802.11n	5270	54	HT7	9.45	9.76
HT40	5310	62	HT7	9.59	9.12
	5260	52	HT8	9.68	10.23
802.11n	5280	56	HT8	10.19	9.92
HT20_MIMO	5300	60	HT8	9.81	9.62
	5320	64	HT8	10.42	9.72
802.11n	5270	54	HT8	8.82	9.35
HT40_MIMO	5310	62	HT8	8.79	8.52



5.5 GHz

	Freq.			Measured Power		
Mode	(MHz)	Ch. #	Rate	[dB m]		
				Main	AUX	
	5500	100	6	12.55	11.21	
Ļ	5520	104	6	12.87	11.18	
	5540	108	6	13.10	11.34	
	5560	112	6	11.99	9.89	
	5580	116	6	12.21	9.60	
802.11a	5600	120	6	11.46	9.78	
	5620	124	6	12.26	9.74	
	5640	128	6	12.28	10.48	
	5660	132	6	14.16	12.19	
	5680	136	6	15.33	12.11	
	5700	140	6	15.45	12.23	
	5500	100	HT0	11.74	10.45	
Γ	5520	104	HT0	11.77	10.24	
Γ	5540	108	HT0	11.76	10.02	
Γ	5560	112	HT0	11.21	9.09	
Γ	5580	116	HT0	10.62	8.74	
802.11n HT20	5600	120	HT0	10.84	8.65	
11120	5620	124	HT0	10.81	9.14	
	5640	128	HT0	11.55	9.32	
	5660	132	HT0	13.56	10.65	
	5680	136	HT0	14.32	10.95	
	5700	140	HT0	14.65	11.25	
	5510	102	HT7	10.77	9.65	
F	5550	110	HT7	10.84	9.26	
802.11n	5590	118	HT7	9.71	7.82	
HT40	5630	130	HT7	10.25	8.23	
F	5670	134	HT7	12.77	9.82	
	5500	100	HT8	11.39	10.23	
F	5520	100	HT8	11.36	9.77	
F	5540	101	HT8	11.29	9.45	
ŀ	5560	112	HT8	10.42	8.52	
F	5580	116	HT8	10.12	8.23	
802.11n	5600	120	HT8	10.35	8.44	
HT20_MIMO	5620	120	HT8	10.38	8.26	
ŀ	5640	121	HT8	11.25	8.70	
ŀ	5660	120	HT8	13.12	10.23	
ŀ	5680	132	HT8	13.69	10.25	
ŀ	5700	140	HT8	13.75	10.62	

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	Freq.			Measured Power		
Mode	(MHz)	Ch. #	Rate	[dB	m]	
	(1112)			Main	AUX	
	5510	102	HT8	10.32	9.25	
	5550	110	HT8	10.52	8.59	
802.11n HT40_MIMO	5590	118	HT8	8.81	7.32	
	5630	126	HT8	9.32	7.62	
	5670	134	HT8	11.86	9.22	
5.8 GHz						
	Energ			Measure	d Power	
Mode	Freq. (MHz)	Ch. #	Rate	[dB m]		
				Main	AUX	
	5745	149	6	12.56	10.37	
Γ	5765	153	6	12.30	10.04	
802.11a	5785	157	6	11.65	9.52	
Ι	5805	161	6	12.50	10.32	
Γ	5825	165	6	14.18	10.46	
	5745	149	HT0	11.52	9.42	
	5765	153	HT0	11.12	9.22	
802.11n HT20	5785	157	HT0	10.72	8.71	
11120	5805	161	HT0	11.92	9.27	
Ī	5825	165	HT0	12.71	9.31	

Note :

802.11n

HT40

11n_20

MIMO

11n_40 MIMO 5755

5795

5745

5765

5785

5805

5825

5755

5795

The modes with highest output power channel were chosen for the conducted output power measurement.

151

159

149

153

157

161

165

151

159

Please refer to original report (FCC ID: A3LXE303C12) for Average Power information as documented in 10/18/2012 original filing.

HT7

HT7

HT8

HT8

HT8

HT8

HT8

HT8

HT8

10.12

9.70

11.20

10.48

10.33

11.12

12.31

10.13

9.22

8.32

7.21

8.94

8.55

8.31

8.56

8.49

7.65

7.21



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3.4 SAR Test Configuration

Notebook Testing for SAR

Devices are to be setup according to KDB 447498 requirements and are configured with maximum output power during SAR assessment for a worst-case SAR evaluation

SAR Testing for Notebook per KDB 447498 & KDB 616217

Per KDB 447498 4) a), the Base is required to be tested touching the flat phantom.

Antenna Output Power (mW)	$\leq 60/f_{(GHz)}$	> 60/f _(GHz)					
Simultaneous	SAR not required: antenna-to-antenna or antenna-to-person distance ≥ 5 cm	SAR not required: antenna-to-antenna \ge (5 + $\frac{1}{2}$ ·n _x + $\frac{1}{2}$ ·n _y) and antenna-to-person \ge (5 + $\frac{1}{2}$ ·n _x) cm					
Transmitting Antennas	SAR not required: when \sum (SAR _{1g}) < SAR limit, antenna-to-antenna distances > 5 cm and antenna-to-user distance > 5 cm if output > $60/f$						
	otherwise, test antenna(s) using highest SAR configuration for the individual transmitter/antenna						

Antenna	Mode	Freq (GHz)	Power (mW)	60/f	n=p/(60/f)-1	Distance thres in cm (1/2n)	Distance thres in cm (5+1/2nx+1/2ny)
	WIFI b 2.4 GHz	2.412	23.39	24.88	-0.06	-0.03	4.96
	WIFI a 5.2 GHz	5.18	10.67	11.58	-0.08	-0.04	4.87
Main	WIFI a 5.3 GHz	5.32	11.02	11.28	-0.02	-0.01	4.95
	WIFI a 5.5 GHz	5.7	23.71	10.53	1.25	0.63	5.67
	WIFI a 5.8 GHz	5.825	17.02	10.30	0.65	0.33	5.20
	WIFI b 2.4 GHz	2.462	23.93	24.37	-0.02	-0.01	4.96
	WIFI a 5.2 GHz	5.18	9.59	11.58	-0.17	-0.09	4.87
AUX	WIFI a 5.3 GHz	5.26	10.54	11.41	-0.08	-0.04	4.95
	WIFI a 5.5 GHz	5.7	11.54	10.53	0.10	0.05	5.67
	WIFI a 5.8 GHz	5.745	7.83	10.44	-0.25	-0.13	5.20

<Summary of SAR Evaluation Requirements>

Antenna-to-antenna = 206.0 mm, Antenna-to-person = 195.0 mm

MIMO: SAR not required



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IEEE 802.11 Transmitters

802.11 a/b/g and 4.9 GHz operating modes are tested independently according to the service requirements in each frequency band. 802.11 b/g modes are tested on channel 1, 6, and 11. 802.11a is tested for UNII operations on channels 36 and 48 in the $5.15 \sim 5.25$ GHz band, channels 52 and 64 in the $5.25 \sim 5.35$ GHz band, channels 104, 116, 124 and 136 in the $5.470 \sim 5.725$ GHz band, and channels 149 and 161 in the 5.8 GHz band. When 5.8 GHz §15.247 is also available, channels 149, 157 and 165 should be tested instead of the UNII channels. 802.11g mode was evaluated only if the output power was 0.25 dB higher than the 802.11b mode.

				т 1	"De	fault Test	Channel	s"
Mo	Mode		Channel	Turbo Channel	§15.247		TIN	II
					802.11b	02.11b 802.11g		11
802.11 b/g		2.412	1#		1	V		
		2.437	б	6	1			
		2.462	11#		1	v		
		5.18	36				- 4	
		5.20	40	42 (5.21 GHz)				•
		5.22	44	10 (0.01 012)				
		5.24	48	50 (5.25 GHz)			4	
		5.26	52	эо (э.ш) от <u>ш</u>)			4	
		5.28	56	58 (5.29 GHz)		1		
		5.30	60	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		(1997) (1997)		
	UNII	5.32	64				1	
		5.500	100					
		5.520	104			1		
		5.540	108					
802.11a		5.560	112		-	-		
	-	5.580	116	·		-		
1		5.600	120	Unknown	1000000			
1		5.620	124		1		1	
67		5.640	128					
		5.660	132		1	1		*
		5.680	136		-		4	
		5.700	140					٠
1.	UNII	5.745	149		4		4	
1	or	5.765	153	152 (5.76 GHz)		•		•
	§15.247	5.785	157		4			٠
	_	5.805	161	160 (5.80 GHz)		•	- 1	
	§15.247	5.825	165		1			

- 🚽 = "default test channels"
- = possible 802.11 a channels with maximum average output > the "default test channels"
- ∇ = possible 802.11g channels with maximum average output ¼ dB ≥ the "default test channels"
- # = when output power is reduced for channel 1 and/or 11 to meet restricted band requirements the highest output channels closest to each of these channels should be tested



Assessment for SAR evaluation for Simultaneous transmission

< Simultaneous Transmission Summation Scenario >

Simultaneous TX	configuration	DCN CDMA SAR(W/kg)	2.4 GHz WIFI SAR (W/kg)	∑SAR (W/kg)
	Base	0.004	0.011	0.015
	configuration	DCN CDMA SAR(W/kg)	5.0 GHz WIFI SAR (W/kg)	∑SAR (W/kg)
	Base	0.004	0.031	0.035
Body SAR				
BOUY SAR	configuration	PCS CDMA SAR(W/kg)	2.4 GHz WIFI SAR (W/kg)	\sum SAR (W/kg)
	Base	0.009	0.011	0.020
	configuration	DCN CDMA SAR(W/kg)	5.0 GHz WIFI SAR (W/kg)	∑SAR (W/kg)
	Base	0.009	0.031	0.040

The above numerical summed SAR was below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit. Therefore, no volumetric SAR summation is required since the numerical sums are below the limit.

CDMA&WLAN + Bluetooth

Due to Bluetooth's max. output is 1.242 mW [<60/f(GHz) mW] and stand-alone SAR is not required, thus WLAN and Bluetooth are not considered as simultaneous transmission.



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3.5 SAR Data Summary

DCN CDMA Body Test

Ambient Temperature (°C)	23.2		
Liquid Temperature (°C)	22.0		
Date	2012-10-16		

Mode	Freq. (MHz)	Ch. #	Service	Position	Separation distance [mm]	Measured Power [dB m]	SAR 1g (W/kg)
DCN	835.52	384	1xRTT (RC3,SO32)	Base	0	24.02	0.003
	835.52	384	1x EVDO (Rev 0)	Base	0	24.36	0.004

<Note>

1. The test data reported are the worst-case SAR value with the position set in a typical configuration.

2. All modes of operation were investigated, and worst-case results are reported.

3. Liquid tissue depth was at least 15 cm.

4. The EUT is tested 2nd hot-spot peak, if it is less than 2 dB below the highest peak.

5. SAR test was performed in the middle channel only as the measured level was < 50% of the SAR limit as stated in FCC "Public Notice DA 02-1438" by the SCC-34/SC-2. Testing in the low and high channel are optional



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Ambient Temperature (°C)	23.7			
Liquid Temperature (°C)	22.9			
Date	2.12-10.17			

PCS. CDMA Body Test

Mode	Freq. (MHz)	Ch. #	Service	Position	Separation distance [mm]	Measured Power [dB m]	SAR 1g (W/kg)
PCS. CDMA	1880.00	600	1xRTT (RC3,SO32)	Base	0	24.16	0.007
	1880.00	600	1x EVDO (Rev 0)	Base	0	24.28	0.009

<Note>

1. The test data reported are the worst-case SAR value with the position set in a typical configuration.

2. All modes of operation were investigated, and worst-case results are reported.

3. Liquid tissue depth was at least 15 cm.

4. The EUT is tested 2nd hot-spot peak, if it is less than 2 dB below the highest peak.

5. SAR test was performed in the middle channel only as the measured level was < 50% of the SAR limit as stated in FCC "Public Notice DA 02-1438" by the SCC-34/SC-2. Testing in the low and high channel are optional



Ambient Temperature (°C)	23.4		
Liquid Temperature (°C)	22.2		
Date	2012-10-10		

2.4 GHz Body Test

Mode	Freq. (MHz)	Ch. #	Rate	Position	Measured Power [dB m]		SAR 1g (W/kg)	
	(1112)				Main	AUX	Main	AUX
202 11h	2412	1	1	Base	15.22	14.67	0.005	Note:9
802.11b	2462	11	1		14.84	16.78	Note:9	0.011

<Note>

1. The test data reported are the worst-case SAR value with the position set in a typical configuration.

2. All modes of operation were investigated, and worst-case results are reported.

3. Liquid tissue depth was at least 15 cm.

4. The EUT is tested 2nd hot-spot peak, if it is less than 2 dB below the highest peak.

5. Justification for reduced test configuration for WIFI channels per KDB Publication 248227 and April 2010 FCC/TCB Meeting Notes: Highest average RF output power channel for the lowest data rate were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11n and higher data rates) were not investigated since the average output powers were not greater than 0.25 dB than that of the corresponding channel in the lowest data rate IEEE 802.11a modes.

6. KDB 447498 exclusion: SAR for highest power channel was < 0.8 W/kg $\,$ and the frequency range is < 100 Mz.



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Ambient Temperature (°C)	23.5		
Liquid Temperature (°C)	22.8		
Date	2012-10-11		

5.2 GHz Body Test

Mode Freq.	Ch. #	Rate	Position	[dB	d Power m]	SAR 1g	(W/kg)
(1112)				Main	AUX	Main	AUX
802.11a 5180	36	6	Base	12.11	11.43	0.022	0.018

<Note>

1. The test data reported are the worst-case SAR value with the position set in a typical configuration.

2. All modes of operation were investigated, and worst-case results are reported.

3. Liquid tissue depth was at least 15 cm.

4. The EUT is tested 2nd hot-spot peak, if it is less than 2 dB below the highest peak.

- 5. Justification for reduced test configuration for WIFI channels per KDB Publication 248227 and April 2010 FCC/TCB Meeting Notes: Highest average RF output power channel for the lowest data rate were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11n and higher data rates) were not investigated since the average output powers were not greater than 0.25 dB than that of the corresponding channel in the lowest data rate IEEE 802.11a modes.
- 6. KDB 447498 exclusion: SAR for highest power channel was < 0.8 W/kg and the frequency range is < 100 Mz.



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Ambient Temperature (°C)	23.7		
Liquid Temperature (°C)	22.9		
Date	2012-10-12		

5.3 GHz Body Test

Mode	Freq. (MHz)	Ch. #	Rate	Position	Measure [dB		SAR 1g	(W/kg)
	(11112)				Main	AUX	Main	AUX
802.11a 5	5320	64	6	Base	11.77	11.84	0.019	0.022

<Note>

1. The test data reported are the worst-case SAR value with the position set in a typical configuration.

2. All modes of operation were investigated, and worst-case results are reported.

3. Liquid tissue depth was at least 15 cm.

4. The EUT is tested 2nd hot-spot peak, if it is less than 2 dB below the highest peak.

- 5. Justification for reduced test configuration for WIFI channels per KDB Publication 248227 and April 2010 FCC/TCB Meeting Notes: Highest average RF output power channel for the lowest data rate were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11n and higher data rates) were not investigated since the average output powers were not greater than 0.25 dB than that of the corresponding channel in the lowest data rate IEEE 802.11a modes.
- 6. KDB 447498 exclusion: SAR for highest power channel was < 0.8 W/kg and the frequency range is < 100 Mz.



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Ambient Temperature (°C)	23.5
Liquid Temperature (°C)	22.2
Date	2012-10-13

5.5 GHz Body Test

Mode	Freq. (MHz)	Ch. #	Rate	Position		ed Power m]	SAR 1g	(W/kg)
	(11112)				Main	AUX	Main	AUX
802.11a	5700	140	6	Base	15.45	13.23	0.021	0.020

<Note>

1. The test data reported are the worst-case SAR value with the position set in a typical configuration.

2. All modes of operation were investigated, and worst-case results are reported.

3. Liquid tissue depth was at least 15 cm.

4. The EUT is tested 2nd hot-spot peak, if it is less than 2 dB below the highest peak.

- 5. Justification for reduced test configuration for WIFI channels per KDB Publication 248227 and April 2010 FCC/TCB Meeting Notes: Highest average RF output power channel for the lowest data rate were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11n and higher data rates) were not investigated since the average output powers were not greater than 0.25 dB than that of the corresponding channel in the lowest data rate IEEE 802.11a modes.
- 6. KDB 447498 exclusion: SAR for highest power channel was < 0.4 W/kg and the frequency range is < 100 Mz.



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Ambient Temperature (°C)	23.8
Liquid Temperature (°C)	22.7
Date	2012-10-14

5.8 GHz Body Test

Mode	Freq. (MHz)	Ch. #	n. # Rate Position	Ch. # Rate Position [dB m]		SAR 1g (W/kg)		
	(11112)				Main	AUX	Main	AUX
802.11a	5825	165	6	Base	14.18	10.46	0.031	0.029

<Note>

1. The test data reported are the worst-case SAR value with the position set in a typical configuration.

2. All modes of operation were investigated, and worst-case results are reported.

3. Liquid tissue depth was at least 15 cm.

4. The EUT is tested 2nd hot-spot peak, if it is less than 2 dB below the highest peak.

- 5. Justification for reduced test configuration for WIFI channels per KDB Publication 248227 and April 2010 FCC/TCB Meeting Notes: Highest average RF output power channel for the lowest data rate were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11n and higher data rates) were not investigated since the average output powers were not greater than 0.25 dB than that of the corresponding channel in the lowest data rate IEEE 802.11a modes.
- 6. KDB 447498 exclusion: SAR for highest power channel was < 0.8 W/kg and the frequency range is < 100 Mz.



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Appendix A

Test Plot - DASY4 Report

18—34, <mark>Sanbon—dong, Gunpo—si, Gyeonggi—do , 453—040 KOREA t+82 31 428 5700 f+82 31 427 2370 www.kr.sgs.com/ee</mark> Member of SGS Group(Société Générale de Suveillance)



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835 Mz Validation Test_Body

Date: 2012-10-16

Test Laboratory: SGS Korea (Gunpo Laboratory) File Name: <u>Validation 835 MHz_Body.da4</u>

Input Power: 100 mW

Ambient Temp : 23.2 °C Tissue Temp : 22.0°C

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

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1 Medium parameters used: f = 835 MHz; $\sigma = 0.966$ mho/m; $\varepsilon_r = 56$; $\rho = 1000$ kg/m³ Phantom section: Flat Section

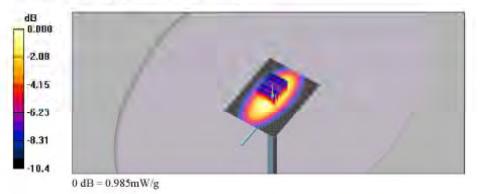
DASY4 Configuration:

- Probe: ET3DV6 SN1782; ConvF(6.22, 6.22, 6.22); Calibrated: 2012-04-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2012-01-20
- Phantom: ELI 4.0_12_05_30; Type: QDOVA001BA; Serial: 1169
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Validation 835 MHz_Body/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm Maximum value of SAR (interpolated) - 0.991 mW/g

Validation 835 MHz_Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 33.0 V/m; Power Drift = -0.013 dB Peak SAR (extrapolated) = 1.35 W/kg SAR(1 g) = 0.918 mW/g; SAR(10 g) = 0.605 mW/g Maximum value of SAR (measured) = 0.985 mW/g



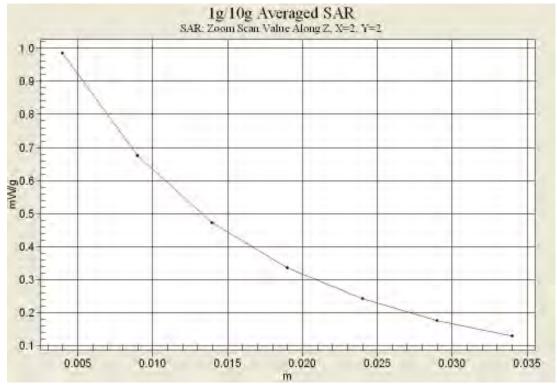


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1900 Mz Validation Test_Body

Date: 2012-10-17

Test Laboratory: SGS Korea (Gunpo Laboratory) File Name: Validation 1900 MHD_Body.da/

Input Power: 100 mW

Ambient Temp : 23.7 C Tissue Temp : 22.9 C

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; $\sigma = 1.52$ mho/m; $v_p = 54$. I; $\rho = 1000$ kg/m³ Phantom section: Flat Section

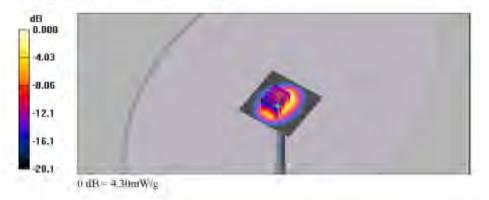
DASY4 Configuration:

- Probe: ET3DV6 SN1782; ConvF(4.59, 4.59, 4.59); Calibrated: 2012-04-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2012-01-20
- Phantom: ELI 4.0 12 05 30; Type: QDOVA001BA; Serial: 1169
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Validation 1900 MHz/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm Maximum value of SAR (interpolated) – 4.61 mW/g

Validation 1900 MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx-8mm, dy-8mm, dz=5mm

Reference Value = 57.3 V/m; Power Drift = -0.066 dB Peak SAR (extrapolated) = 6.86 W/kg SAR(1 g) = 3.86 mW/g; SAR(10 g) = 2 mW/g Maximum value of SAR (measured) = 4.30 mW/g



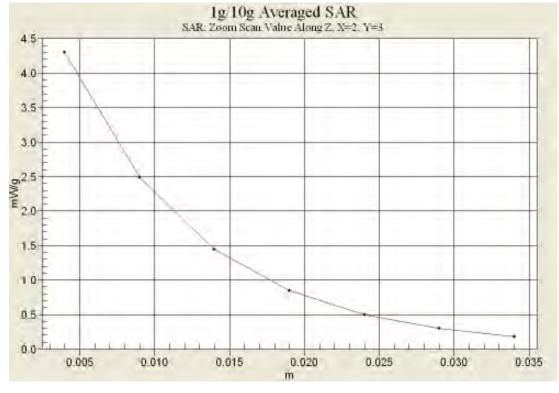


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2450 Mz Validation Test_Body

Date: 2012-10-10

Test Laboratory: SGS Korea (Gunpo Laboratory) File Name: <u>Validation 2450 MHz_Body.da4</u>

Input Power: 100 mW

Ambient Temp : 23.4 °C Tissue Temp : 22.2°C

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:746 Program Name: Validation 2450 MHz_Body

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1 Medium parameters used: f = 2450 MHz; σ = 1.99 mho/m; ϵ_r = 51.9; ρ = 1000 kg/m³ Phantom section: Flat Section

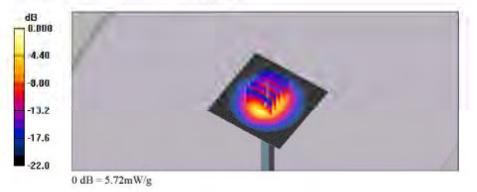
DASY4 Configuration:

- Probe: ET3DV6 SN1782; ConvF(4.11, 4.11, 4.11); Calibrated: 2012-04-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2012-01-20
- Phantom: ELI 4.0_12_05_30; Type: QDOVA001BA; Serial: 1169
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Validation 2450 MHz_Body/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm Maximum value of SAR (interpolated) - 5.83 mW/g

Validation 2450 MHz_Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid; dx=8mm, dy=8mm, dz=5mm

Reference Value = 57.8 V/m; Power Drift = -0.023 dB Peak SAR (extrapolated) = 10.6 W/kg SAR(1 g) = 5.12 mW/g; SAR(10 g) = 2.42 mW/g Maximum value of SAR (measured) = 5.72 mW/g



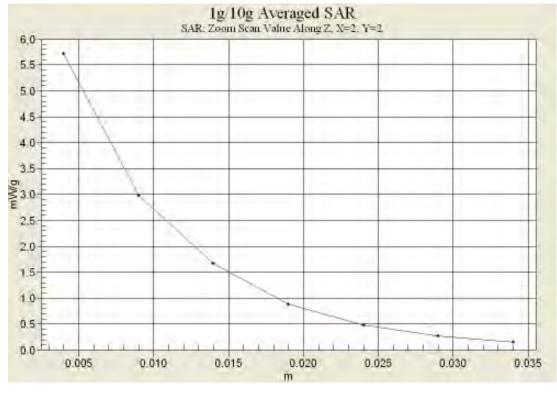


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5200 Mz Validation Test_Body

Date: 2012-10-11

Test Laboratory: SGS Korea (Gunpo Laboratory) File Name: Validation 5200 MHz_Body.da4

Input Power: 100 mW

Ambient Temp : 23.5 °C Tissue Temp : 22.8°C

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: 1130 **Program Name: Body Validation**

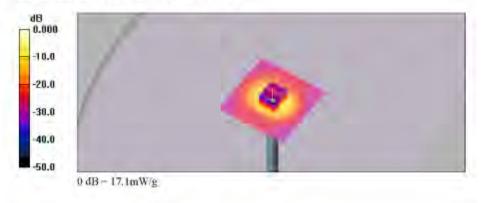
Communication System: CW; Frequency: 5200 MHz; Duty Cycle: 1:1 Medium parameters used: f = 5200 MHz; $\sigma = 5.29 \text{ mho/m}$; $\epsilon_r = 48.4$; $\rho = 1000 \text{ kg/m}^3$ Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 SN3791; ConvF(4, 4, 4); Calibrated: 2012-05-23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2012-01-20
- Phantom: ELI 4.0_12_05_30; Type: QDOVA001BA; Serial: 1169
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Validation/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm Maximum value of SAR (interpolated) - 16.8 mW/g

Validation/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx-4mm, dy-4mm, dz-2mm Reference Value = 49.9 V/m; Power Drift = -0,101 dB Peak SAR (extrapolated) - 33.7 W/kg SAR(1 g) = 7.96 mW/g; SAR(10 g) = 2.14 mW/g Maximum value of SAR (measured) = 17.1 mW/g



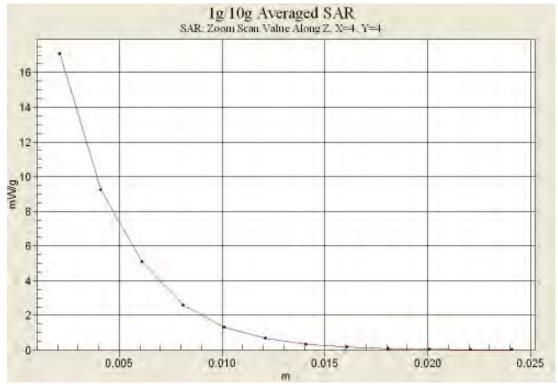


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Date: 2012-10-12

Test Laboratory: SGS Korea (Gunpo Laboratory) File Name: <u>Validation 5200 MHz_Body.da4</u>

Input Power: 100 mW

Ambient Temp : 23.7 °C Tissue Temp : 22.9°C

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: 1130 Program Name: Body Validation

Communication System: CW; Frequency: 5200 MHz;Duty Cycle: 1:1 Medium parameters used: f = 5200 MHz; σ = 5.37 mho/m; ϵ_r = 50.2; ρ = 1000 kg/m³ Phantom section: Flat Section

DASY4 Configuration:

Probe: EX3DV4 - SN3791; ConvF(4, 4, 4); Calibrated: 2012-05-23

- Sensor-Surface: 2mm (Mechanical Surface Detection)

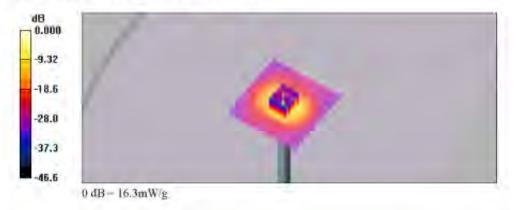
- Electronics: DAE3 Sn567; Calibrated: 2012-01-20

- Phantom: ELI 4.0_12_05_30; Type: QDOVA001BA; Serial: 1169

- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Validation/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm Maximum value of SAR (interpolated) – 16.4 mW/g

Validation/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx-4mm, dy-4mm, dz-2mm Reference Value = 49.7 V/m; Power Drift = 0.052 dB Peak SAR (extrapolated) - 33.8 W/kg SAR(1 g) = 7.86 mW/g; SAR(10 g) = 2.12 mW/g Maximum value of SAR (measured) = 16.3 mW/g



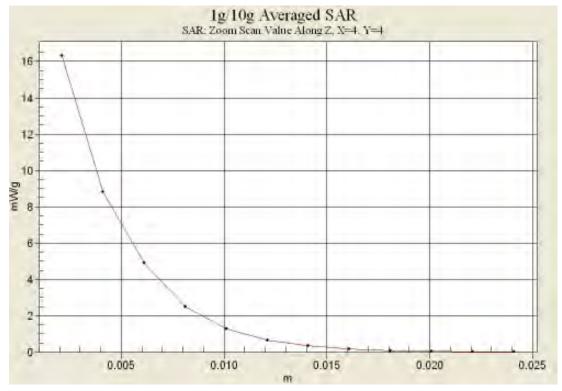


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5500 Mz Validation Test_Body

Date: 2012-10-13

Test Laboratory: SGS Korea (Gunpo Laboratory) File Name: <u>Validation 5500 MHz_Body.da4</u>

Input Power : 100 mW

Ambient Temp : 23.5 °C Tissue Temp : 22.2°C

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: 1130 Program Name: Body Validation

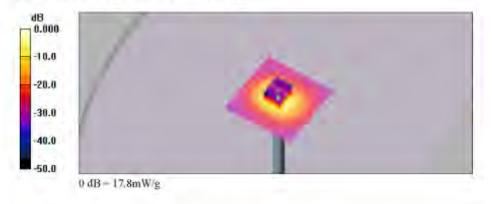
Communication System: CW; Frequency: 5500 MHz;Duty Cycle: 1:1 Medium parameters used: f = 5500 MHz; σ = 5.51 mho/m; ε_r = 48.3; ρ = 1000 kg/m³ Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 SN3791; ConvF(3.64, 3.64, 3.64); Calibrated: 2012-05-23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2012-01-20
- Phantom: ELI 4.0_12_05_30; Type: QDOVA001BA; Serial: 1169
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Validation/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm Maximum value of SAR (interpolated) - 17.3 mW/g

Validation/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx-4mm, dy-4mm, dz-2mm Reference Value = 51.7 V/m; Power Drift = -0.069 dB Peak SAR (extrapolated) = 36.2 W/kg SAR(1 g) = 8.15 mW/g; SAR(10 g) = 2.27 mW/g Maximum value of SAR (measured) = 17.8 mW/g



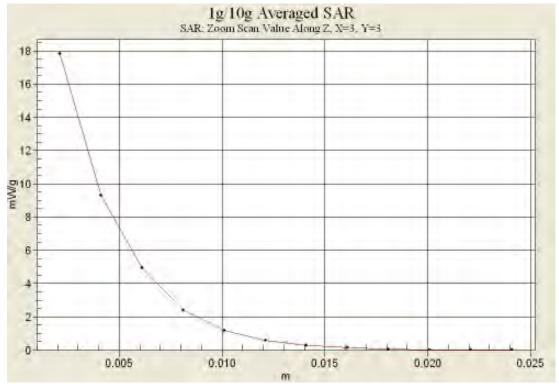


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5800 Mz Validation Test_Body

Date: 2012-10-14

Test Laboratory: SGS Korea (Gunpo Laboratory) File Name: <u>Validation 5800 MHz_Body.da4</u>

Input Power: 100 mW

Ambient Temp : 23.8 °C Tissue Temp : 22.7°C

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: 1130 Program Name: Body Validation

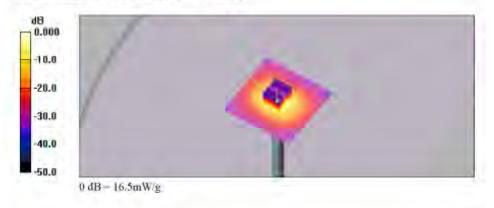
Communication System: CW; Frequency: 5800 MHz;Duty Cycle: 1:1 Medium parameters used: f = 5800 MHz; σ = 5.93 mho/m; ε_r = 47.7; ρ = 1000 kg/m³ Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 SN3791; ConvF(3.79, 3.79, 3.79); Calibrated: 2012-05-23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2012-01-20
- Phantom: ELI 4.0 12 05 30; Type: QDOVA001BA; Serial: 1169
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Validation/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm Maximum value of SAR (interpolated) - 16.9 mW/g

Validation/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx-4mm, dy-4mm, dz-2mm Reference Value = 47.2 V/m; Power Drift = -0.017 dB Peak SAR (extrapolated) = 34.2 W/kg SAR(1 g) = 7.71 mW/g; SAR(10 g) = 2.15 mW/g Maximum value of SAR (measured) = 16.5 mW/g



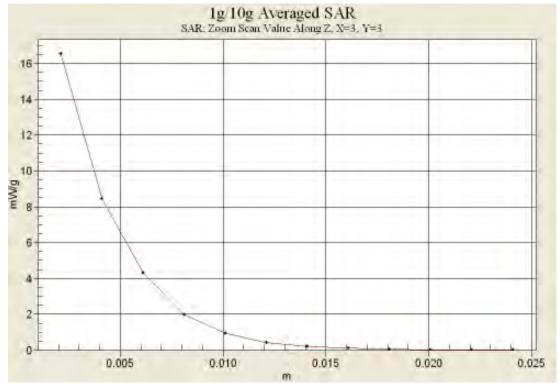


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DCN. CDMA Body SAR

Date: 2012-10-16

Test Laboratory: SGS Korea (Gunpo Laboratory) File Name: DCN_Base_CH384.da4

Ambient Temp : 23.2 °C Tissue Temp : 22.0°C

DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E Program Name: DCN_Body

Communication System: CDMA 835MHz; Frequency: 836.52 MHz;Duty Cycle: 1:1 Medium parameters used: f = 837 MHz; $\sigma = 0.968 \text{ mho/m}$; $\epsilon_r = 56$; $\rho = 1000 \text{ kg/m}^3$ Phantom section: Flat Section

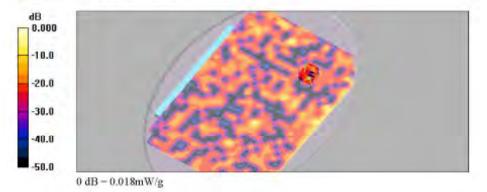
DASY4 Configuration:

- Probe: ET3DV6 SN1782; ConvF(6.22, 6.22, 6.22); Calibrated: 2012-04-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2012-01-20
- Phantom: ELI 4.0_12_05_30; Type: QDOVA001BA; Serial: 1169
 Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DCN CH384 Base/Area Scan (201x301x1): Measurement grid: dx=15mm, dy=15mm Maximum value of SAR (interpolated) = 0.005 mW/g

DCN CH384 Base/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 1.60 V/m; Power Drift = -0.050 dB Peak SAR (extrapolated) = 0.040 W/kg SAR(1 g) = 0.0028 mW/g; SAR(10 g) = 0.00039 mW/g Maximum value of SAR (measured) = 0.018 mW/g





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Date: 2012-10-16

Test Laboratory: SGS Korea (Gunpo Laboratory) File Name: DCN_Base_Ev-Do_CH384.da4

Ambient Temp : 23.2 °C Tissue Temp : 22.0°C

DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E Program Name: DCN_Body

Communication System: CDMA 835MHz; Frequency: 836.52 MHz;Duty Cycle: 1:1 Medium parameters used: f = 837 MHz; σ = 0.968 mho/m; ϵ_r = 56; ρ = 1000 kg/m³ Phantom section: Flat Section

DASY4 Configuration:

Probe: ET3DV6 - SN1782; ConvF(6.22, 6.22, 6.22); Calibrated: 2012-04-27

- Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE3 Sn567; Calibrated: 2012-01-20

- Phantom: ELI 4.0_12_05_30; Type: QDOVA001BA; Serial: 1169

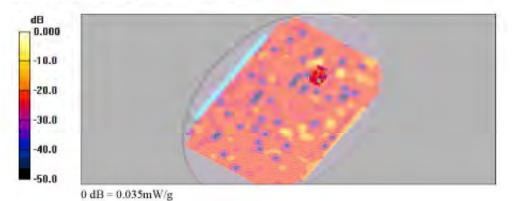
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

DCN_CH384_Base_Ev-Do/Area Scan (201x301x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) - 0.028 mW/g

DCN_CH384_Base_Ev-Do/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 1.60 V/m; Power Drift = 0.167 dB Peak SAR (extrapolated) = 0.060 W/kg SAR(1 g) = 0.00409 mW/g; SAR(10 g) = 0.000598 mW/g Maximum value of SAR (measured) - 0.035 mW/g





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PCS. CDMA Body Test

Date: 2012-10-17

Test Laboratory: SGS Korea (Gunpo Laboratory) File Name PCS Base (11600.dol)

Ambient Temp : 23.7 C Tissue Temp : 22.9 C

DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E Program Name: DCN_Body

Communication System: US PCS; Frequency: 1880 MHz; Duty Cycle: 1:1 Medium parameters used: f = 1880 MHz: $\sigma = 1.5$ mb/m: $\epsilon_c = 54.2$; $\rho = 1000$ kg/m³ Phantom section: Flat Section

DASY4 Configuration:

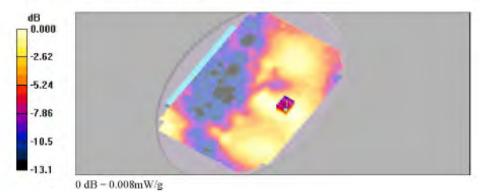
- Probe: ET3DV6 - SN1782; ConvF(4.59, 4.59, 4.59); Calibrated: 2012-04-27

- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2012-01-20
 Phantom: ELI 4.0_12_05_30; Type: QDOVA001BA; Serial: 1169
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

PCS_CH600_Base/Area Scan (201x301x1): Measurement grid: dx-15mm, dy-15mm Maximum value of SAR (interpolated) = 0.008 mW/g

PCS CH600 Base/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 1.17 V/m; Power Drift = -0.039 dB Peak SAR (extrapolated) - 0.011 W/kg SAR(1 g) = 0.00699 mW/g; SAR(10 g) = 0.00472 mW/g Maximum value of SAR (measured) = 0.008 mW/g





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Date: 2012-10-17

Test Laboratory: SGS Korea (Gunpo Laboratory) File Name: PCS_Base_Ev-Do_C11600.da4

Ambient Temp : 23.7 C Tissue Temp : 22.9 C

DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E Program Name: DCN_Body

Communication System: US PCS; Frequency: 1880 MHz;Duty Cycle: 1:1 Medium parameters used: $\Gamma = 1880$ MHz; $\sigma = 1.5$ mho/m; $\epsilon_{p} = 54.2$; $\rho = 1000$ kg/m³ Phantom section: Flat Section

DASY4 Configuration:

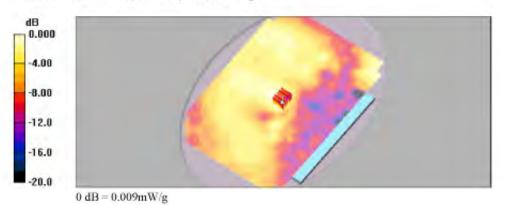
- Probe: ET3DV6 SN1782; ConvF(4.59, 4.59, 4.59); Calibrated: 2012-04-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2012-01-20
- Phantom: ELI 4.0_12_05_30; Type: QDOVA001BA; Serial: 1169
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

PCS_CH600_Base_Ev-Do/Area Scan (201x301x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) - 0.010 mW/g

PCS_CH600_Base_Ev-Do/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx-8mm, dy=8mm, dz=5mm Reference Value - 2.60 V/m; Power Drift - 0.112 dB Peak SAR (extrapolated) = 0.014 W/kg

SAR(1 g) = 0.00873 mW/g; SAR(10 g) = 0.00548 mW/g Maximum value of SAR (measured) = 0.009 mW/g





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2.45 GHz WLAN Body SAR

Date: 2012-10-10

Test Laboratory: SGS Korea (Gunpo Laboratory) File Name: WLAN_Base_11b_1Mbps_CH1_Main_ANT.da4

Ambient Temp : 23.4 °C Tissue Temp : 22.2 °C

DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E Program Name: WLAN_Body

Communication System: WLAN; Frequency: 2412 MHz;Duty Cycle: 1:1 Medium parameters used: f = 2412 MHz; σ = 1.93 mho/m; ϵ_r = 52; ρ = 1000 kg/m³ Phantom section: Flat Section

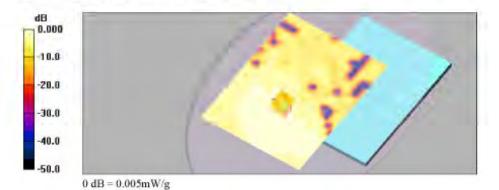
DASY4 Configuration:

- Probe: ET3DV6 SN1782; ConvF(4.11, 4.11, 4.11); Calibrated: 2012-04-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2012-01-20
- Phantom: ELI 4.0_12_05_30; Type: QDOVA001BA; Serial: 1169
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

WLAN_11b_CH1_Base_Main ANT/Area Scan (151x201x1): Measurement grid: dx=15mm, dy=15mm Maximum value of SAR (interpolated) - 0.005 mW/g

WLAN_11b_CH1_Base_Main ANT/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.886 V/m; Power Drift = 0.179 dB Peak SAR (extrapolated) = 0.018 W/kg SAR(1 g) = 0.00458 mW/g; SAR(10 g) = 0.00198 mW/g Maximum value of SAR (measured) = 0.005 mW/g





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Date: 2012-10-10

Test Laboratory: SGS Korea (Gunpo Laboratory) File Name: WLAN_Base_11b_1Mbps_CH11_AUX ANT.da4

Ambient Temp : 23.4 °C Tissue Temp : 22.2 °C

DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E Program Name: WLAN_Body

Communication System: WLAN; Frequency: 2462 MHz;Duty Cycle: 1:1 Medium parameters used: f = 2462 MHz; σ = 2.01 mho/m; ϵ_r = 51.9; ρ = 1000 kg/m³ Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1782; ConvF(4.11, 4.11, 4.11); Calibrated: 2012-04-27

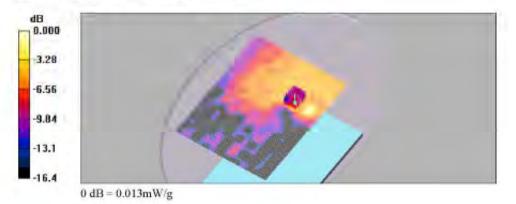
- Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE3 Sn567; Calibrated: 2012-01-20

- Phantom: ELI 4.0_12_05_30; Type: QDOVA001BA; Serial: 1169
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

WLAN_11b_CH11_Base_AUX ANT/Area Scan (151x201x1): Measurement grid: dx=15mm, dy=15mm Maximum value of SAR (interpolated) - 0.013 mW/g

WLAN_11b_CH11_Base_AUX ANT/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm Reference Value = 0.897 V/m; Power Drift = 0.098 dB Peak SAR (extrapolated) = 0.021 W/kg SAR(1 g) = 0.011 mW/g; SAR(10 g) = 0.00586 mW/g Maximum value of SAR (measured) = 0.013 mW/g





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5.2 GHz WLAN Body SAR

Date: 2012-10-11

Test Laboratory: SGS Korea (Gunpo Laboratory) File Name: WLAN_Base_11a_6Mbps_CH36_Main_ANT.da4

Ambient Temp : 23.5 °C Tissue Temp : 22.8 °C

DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Low); Frequency: 5180 MHz;Duty Cycle: 1:1 Medium parameters used: f = 5180 MHz; σ = 5.25 mho/m; ϵ_r = 48.5; ρ = 1000 kg/m³ Phantom section: Flat Section

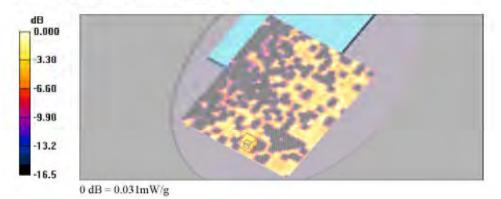
DASY4 Configuration:

- Probe: EX3DV4 SN3791; ConvF(4, 4, 4); Calibrated: 2012-05-23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2012-01-20
- Phantom: ELI 4.0_12_05_30; Type: QDOVA001BA; Serial: 1169
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

WLAN_11a_CH36_Base_Main ANT/Area Scan (241x301x1): Measurement grid: dx=10mm, dy=10mm Maximum value of SAR (interpolated) = 0.045 mW/g

WLAN_11a_CH36_Base_Main ANT/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.40 V/m; Power Drift = 0.097 dB Peak SAR (extrapolated) = 0.035 W/kg SAR(1 g) = 0.022 mW/g; SAR(10 g) = 0.018 mW/g Maximum value of SAR (measured) - 0.031 mW/g





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Date: 2012-10-11

Test Laboratory: SGS Korea (Gunpo Laboratory) File Name: WLAN_Base_11a_6Mbps_CH36_AUX_ANT.da4

Ambient Temp : 23.5 °C Tissue Temp : 22.8°C

DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E Program Name: WLAN_Body

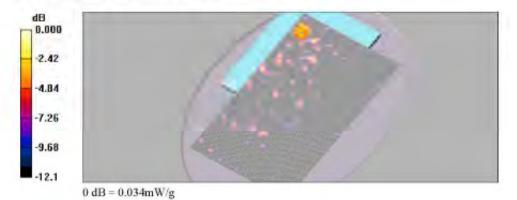
Communication System: WLAN(11a_U-NII Low); Frequency: 5180 MHz;Duty Cycle: 1:1 Medium parameters used: f = 5180 MHz; $\sigma = 5.25$ mho/m; $\epsilon_r = 48.5$; $\rho = 1000$ kg/m³ Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 SN3791; ConvF(4, 4, 4); Calibrated: 2012-05-23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2012-01-20
- Phantom: ELI 4.0_12_05_30; Type: QDOVA001BA; Serial: 1169
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

WLAN_11a_CH36_Base_AUX ANT/Area Scan (241x421x1): Measurement grid: dx=10mm, dy=10mm Maximum value of SAR (interpolated) = 0.021 mW/g

WLAN_11a_CH36_Base_AUX ANT/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm Reference Value = 0.734 V/m; Power Drift = -0.086 dB Peak SAR (extrapolated) = 0.055 W/kg SAR(1 g) = 0.018 mW/g; SAR(10 g) = 0.015 mW/g Maximum value of SAR (measured) - 0.034 mW/g





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5.3 GHz WLAN Body SAR

Date: 2012-10-12

Test Laboratory: SGS Korea (Gunpo Laboratory) File Name: WLAN_Base_11a_6Mbps_CH64_Main_ANT.da4

Ambient Temp : 23.7 °C Tissue Temp : 22.9 °C

DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Low); Frequency: 5320 MHz;Duty Cycle: 1:1 Medium parameters used: f = 5320 MHz; $\sigma = 5.53$ mho/m; $\epsilon_r = 50$; $\rho = 1000$ kg/m³ Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 SN3791; ConvF(3.7, 3.7, 3.7); Calibrated: 2012-05-23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2012-01-20
- Phantom: ELI 4.0_12_05_30; Type: QDOVA001BA; Serial: 1169
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

WLAN_11a_CH64_Base_Main ANT/Area Scan (241x421x1): Measurement grid: dx=10mm, dy=10mm Maximum value of SAR (interpolated) = 0.030 mW/g

WLAN_11a_CH64_Base_Main ANT/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.56 V/m; Power Driff = 0.137 dB Peak SAR (extrapolated) = 0.031 W/kg SAR(1 g) = 0.019 mW/g; SAR(10 g) = 0.015 mW/g Maximum value of SAR (measured) - 0.031 mW/g





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Date: 2012-10-12

Test Laboratory: SGS Korea (Gunpo Laboratory) File Name: WLAN_Base_11a_6Mbps_CH64_AUX_ANT.da4

Ambient Temp : 23.7 °C Tissue Temp : 22.9°C

DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E Program Name: WLAN_Body

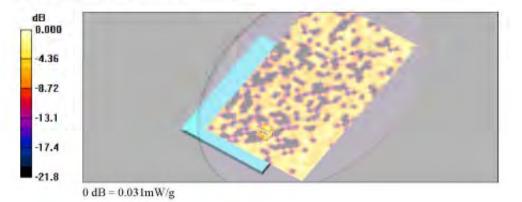
Communication System: WLAN(11a_U-NII Low); Frequency: 5320 MHz;Duty Cycle: 1:1 Medium parameters used: f = 5320 MHz; $\sigma = 5.53$ mho/m; $\epsilon_r = 50$; $\rho = 1000$ kg/m³ Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 SN3791; ConvF(3.7, 3.7, 3.7); Calibrated: 2012-05-23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2012-01-20
- Phantom: ELI 4.0_12_05_30; Type: QDOVA001BA; Serial: 1169
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

WLAN_11a_CH64_Base_AUX ANT/Area Scan (241x421x1): Measurement grid: dx=10mm, dy=10mm Maximum value of SAR (interpolated) = 0.023 mW/g

WLAN_11a_CH64_Base_AUX ANT/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm Reference Value = 1.21 V/m; Power Drift = 0.083 dB Peak SAR (extrapolated) = 0.032 W/kg SAR(1 g) = 0.022 mW/g; SAR(10 g) = 0.016 mW/g Maximum value of SAR (measured) - 0.031 mW/g





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5.5 GHz WLAN Body SAR

Date: 2012-10-13

Test Laboratory: SGS Korea (Gunpo Laboratory) File Name: WLAN Base 11a 6Mbps CH140 Main ANT.day

Ambient Temp : 23.5 °C Tissue Temp : 22.2 °C

DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E Program Name: WLAN Body

Communication System: WLAN(11a H or CEPT); Frequency: \$700 MHz;Duty Cycle: 1:1 Medium parameters used: f = 5700 MHz: $\sigma = 5.76$ mho/m: $\epsilon_r = 48$: $\rho = 1000$ kg/m³ Phantom section: Flat Section

DASY4 Configuration:

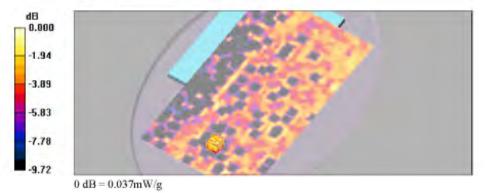
- Probe: EX3DV4 SN3791; ConvF(3.31, 3.31, 3.31); Calibrated: 2012-05-23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2012-01-20
- Phantom: ELI 4.0_12_05_30; Type: QDOVA001BA; Serial: 1169
 Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

WLAN_11a_CH140_Base_Main ANT/Area Scan (241x421x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) - 0.041 mW/g

WLAN_11a_CH140_Base_Main ANT/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value - 1.50 V/m; Power Drift - -0.034 dB Peak SAR (extrapolated) = 0.089 W/kg SAR(1 g) = 0.021 mW/g; SAR(10 g) = 0.011 mW/g Maximum value of SAR (measured) = 0.037 mW/g





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Date: 2012-10-13

Test Laboratory: SGS Korea (Gunpo Laboratory) File Name: WLAN Base: IIa. 6Mbps: CH140_AUX ANT das

Ambient Temp : 23.5 °C Tissue Temp : 22.2 °C

DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E Program Name: WLAN_Body

Communication System: WLAN(Ha_H or CEPT); Frequency: 5700 MHz;Duty Cycle: 1:1 Medium parameters used: f = 5700 MHz; $\sigma = 5.76$ mho/m; $a_p = 48$; $\rho = 1000$ kg/m³ Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3791; ConvF(3.31, 3.31, 3.31); Calibrated: 2012-05-23

- Sensor-Surface: 2mm (Mechanical Surface Detection)

- Electronics: DAE3 Sn567; Calibrated: 2012-01-20

- Phantom: ELI 4.0_12_05_30; Type: QDOVA001BA; Serial: 1169

- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

WLAN_11a_CH140_Base_AUX ANT/Area Scan (241x421x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) - 0.036 mW/g

WLAN_11a_CH140_Base_AUX ANT/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm Reference Value = 1.13 V/m; Power Drift = 0.178 dB Peak SAR (extrapolated) = 0.031 W/kg SAR(1 g) = 0.020 mW/g; SAR(10 g) = 0.016 mW/g Maximum value of SAR (measured) = 0.031 mW/g





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5.8 GHz WLAN Body SAR

Date: 2012-10-14

Test Laboratory: SGS Korea (Gunpo Laboratory) File Name: WLAN Base 11a 6Mbps CH165 Main ANT.da4

Ambient Temp : 23.8 °C Tissue Temp : 22.7°C

DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Upper); Frequency: 5825 MHz;Duty Cycle: 1:1 Medium parameters used: f = 5825 MHz; σ = 5.96 mho/m; ϵ_r = 47.7; ρ = 1000 kg/m³ Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 SN3791; ConvF(3.79, 3.79, 3.79); Calibrated: 2012-05-23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2012-01-20
- Phantom: ELI 4.0_12_05_30; Type: QDOVA001BA; Serial: 1169

- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

WLAN_11a_CH165_Base_Main ANT/Area Scan (241x421x1): Measurement grid: dx=10mm, dv=10mm

Maximum value of SAR (interpolated) - 0.030 mW/g

WLAN_11a_CH165_Base_Main ANT/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 0.914 V/m; Power Drift = 0.183 dB Peak SAR (extrapolated) = 0.045 W/kg SAR(1 g) = 0.031 mW/g; SAR(10 g) = 0.027 mW/g Maximum value of SAR (measured) = 0.045 mW/g





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Date: 2012-10-14

Test Laboratory: SGS Korea (Gunpo Laboratory) File Name: WLAN_Base_11a_6Mbps_CH165_AUX ANT.da4

Ambient Temp : 23.8 °C Tissue Temp : 22.7°C

DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Upper); Frequency: 5825 MHz;Duty Cycle: 1:1 Medium parameters used: f = 5825 MHz; σ = 5.96 mho/m; ϵ_r = 47.7; ρ = 1000 kg/m³ Phantom section: Flat Section

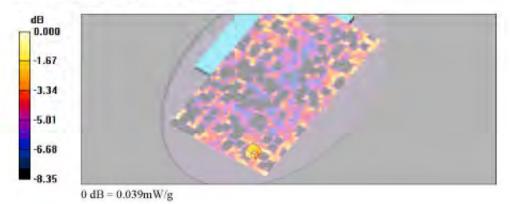
DASY4 Configuration:

- Probe: EX3DV4 SN3791; ConvF(3.79, 3.79, 3.79); Calibrated: 2012-05-23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2012-01-20
- Phantom: ELI 4.0_12_05_30; Type: QDOVA001BA; Serial: 1169
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

WLAN_11a_CH165_Base_AUX ANT/Area Scan (241x421x1): Measurement grid: dx=10mm, dy=10mm Maximum value of SAR (interpolated) - 0.053 mW/g

WLAN_11a_CH165_Base_AUX ANT/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.61 V/m; Power Drift = 0.086 dB Peak SAR (extrapolated) = 0.039 W/kg SAR(1 g) = 0.029 mW/g; SAR(10 g) = 0.025 mW/g Maximum value of SAR (measured) - 0.039 mW/g





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Uncertainty Analysis (2.45GHz)

a	b	С	d	e = f(d,k)	g	i = cxg/e
Uncertainty Component	Section in P1528	Tol (%)	Prob . Dist.	Div.	Ci (1g)	1g ui (%)
Probe calibration	E.2.1	6.0	N	1	1	6.0
Axial isotropy	E.2.2	0.5	R	1.73	0.71	0.20
hemispherical isotropy	E.2.2	2.6	R	1.73	0.71	1.06
Boundary effect	E.2.3	0.8	R	1.73	1	0.46
Linearity	E.2.4	0.6	R	1.73	1	0.35
System detection limit	E.2.5	0.25	R	1.73	1	0.14
Readout electronics	E.2.6	0.3	N	1	1	0.30
Response time	E.2.7	0	R	1.73	1	0.00
Integration time	E.2.8	2.6	R	1.73	1	1.50
RF ambient Condition -Noise	E.6.1	3	R	1.73	1	1.73
RF ambient Condition - reflections	E.6.1	3	R	1.73	1	1.73
Probe positioning- mechanical tolerance	E.6.2	1.5	R	1.73	1	0.87
Probe positioning- with respect to phantom	E.6.3	2.9	R	1.73	1	1.67
Max. SAR evaluation	E.5.2	1	R	1.73	1	0.58
Test sample positioning	E.4.2	5.84	N	1	1	5.84
Device holder uncertainty	E.4.1	3.6	N	1	1	3.60
Output power variation-SAR drift measurement	6.62	5	R	1.73	1	2.89
Phantom uncertainty (shape and thickness tolerances)	E.3.1	4	R	1.73	1	2.31
Liquid conductivity - deviation from target values	E.3.2	5	R	1.73	0.64	1.85
Liquid conductivity - measurement uncertainty	E.3.2	0.7	N	1	0.64	0.45
Liquid permittivity - deviation from target values	E.3.3	5	R	1.73	0.6	1.73
Liquid permittivity - measurement uncertainty	E.3.3	0.56	N	1	0.6	0.34
Combined standard uncertainty				RSS		10.83
Expanded uncertainty (95% CONFIDENCE INTERVAL)				K=2		21.65



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Uncertainty Analysis (5GHz)

a	b	С	d	e = f(d,k)	g	i = cxg/e
Uncertainty Component	Section in P1528	Tol (%)	Prob . Dist.	Div.	Ci (1g)	1g ui (%)
Probe calibration	E.2.1	6.55	N	1	1	6.55
Axial isotropy	E.2.2	0.5	R	1.73	0.71	0.20
hemispherical isotropy	E.2.2	2.6	R	1.73	0.71	1.06
Boundary effect	E.2.3	0.8	R	1.73	1	0.46
Linearity	E.2.4	0.6	R	1.73	1	0.35
System detection limit	E.2.5	0.25	R	1.73	1	0.14
Readout electronics	E.2.6	0.3	N	1	1	0.30
Response time	E.2.7	0	R	1.73	1	0.00
Integration time	E.2.8	2.6	R	1.73	1	1.50
RF ambient Condition -Noise	E.6.1	3	R	1.73	1	1.73
RF ambient Condition - reflections	E.6.1	3	R	1.73	1	1.73
Probe positioning- mechanical tolerance	E.6.2	1.5	R	1.73	1	0.87
Probe positioning- with respect to phantom	E.6.3	2.9	R	1.73	1	1.67
Max. SAR evaluation	E.5.2	1	R	1.73	1	0.58
Test sample positioning	E.4.2	2.3	Ν	1	1	5.84
Device holder uncertainty	E.4.1	3.6	Ν	1	1	3.60
Output power variation-SAR drift measurement	6.62	5	R	1.73	1	2.89
Phantom uncertainty (shape and thickness tolerances)	E.3.1	4	R	1.73	1	2.31
Liquid conductivity - deviation from target values	E.3.2	5	R	1.73	0.64	1.85
Liquid conductivity - measurement uncertainty	E.3.2	2.68	Ν	1	0.64	0.45
Liquid permittivity - deviation from target values	E.3.3	10	R	1.73	0.6	1.73
Liquid permittivity - measurement uncertainty	E.3.3	1.20	Ν	1	0.6	0.34
Combined standard uncertainty				RSS		11.14
Expanded uncertainty (95% CONFIDENCE INTERVAL)				K=2		22.28



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Appendix C

Calibration Certificate

- PROBE (ET3DV6, EX3DV4)

- DAE 3

-835 MHz / 1900 MHz / 2450 MHz / 5 GHz DIPOLE



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- PROBE Calibration Certificate (ET3DV6)

	e recognition of calibration	s to the EA certificates	No.: SCS 108
CALIBRATION		Constant Constant	ET3-1782_Apr12
Object	ET3DV6 - SN:17		
Calibration procedure(s)		DA CAL-12.v7, QA CAL-23.v4, QA dure for dosimetric E-field probes	CAL-25.v4
Calibration date:	April 27, 2012		
		ry facility: environment temperature (22 ± 3)°C i	and humidity < 70%.
Calibration Equipment used (M			
Calibration Equipment used (M	ATE critical for calibration)	y facility: environment temperature (22 ± 3)*C / Cal Date (Certificate No.) 29-Mar-12 (No. 217-01505)	sind humidity < 70%.
Calibration Equipment used (M Prenary Standards	NATE critical for calibration)	Cal Date (Certificate No.)	Scheduled Calibration
Calibration Equipment used (M Premary Standards Power metter E44198	NATE critical for calibration)	Cai Date (Certificate No.) 29-Mar-12 (No. 217-01808)	Scheduled Calibration
Calibration Equipment used (M Premary Standards Power meter E44198 Power sensor E4412A	ID GB41283874 MY4: 490887	Cai Date (Certificate No.) 29-Mar-12 (No. 217-01508) 29-Mar-12 (No. 217-01508)	Scheduled Calibration April 12 April 3
Calibration Equipment used (M Prenary Standards Power meter E44198 Power sensor E4412A Reference 3 dB Attenustor Reference 30 dB Attenustor	8TE critical for calibration) ID GB41283874 MY41490007 SN: 35054 (3c)	Cai Date (Certificate No.) 29-Mar-12 (No. 217-01505) 29-Mar-12 (No. 217-01505) 27-Mar-12 (No. 217-01505)	Scheduled Calibration Apr-12 Apr-13 Apr-13
Calibration Equipment used (M Prenary Standards Power meter E44198 Power sensor E4412A Reference 3 dB Liternator Reference 30 dB Attenuator Reference 30 dB Attenuator Reference 30 dB Attenuator	4TE orlical for calibration) 4D 43941293574 MY4446007 SN: 35054(3b) SN: 35129(300) SN: 35129(300) SN: 35129(300) SN: 35129(300)	Cai Date (Certificate No.) 29-Mar-12 (No. 217-01608) 29-Mar-12 (No. 217-01608) 27-Mar-12 (No. 217-01631) 27-Mar-12 (No. 217-01632) 27-Mar-12 (No. 217-01632) 27-Mar-12 (No. 217-01632) 29-Dec-11 (No. ES3-3013_Dec11)	Scheduled Calibration Apr-13 Apr-13 Apr-13 Apr-13 Apr-13 Apr-13 Dec-12
Calibration Equipment used (M Prenary Standards Power meter E44198 Power sensor E4412A Reference 3 dB Liternator Reference 30 dB Attenuator Reference 30 dB Attenuator Reference 30 dB Attenuator	8TE critical for calibration) (B41293874 MY44 480007 SN: 35054 (3b) SN: 85086 (20b) SN: 86129 (30b)	Cai Date (Certificate No.) 29-Mar-12 (No. 217-01508) 28-Mar-12 (No. 217-01508) 27-Mar-12 (No. 217-01531) 27-Mar-12 (No. 217-01532) 27-Mar-12 (No. 217-01532)	Scheduled Calibration April 12 April 13 April 13 April 13 April 13 April 13
Calibration Equipment used (M Prenary Standards Power meter E44198 Power sensor E4412A Reference 3 dB Attenuator Reference 30 dB Attenuator Roference 30 dB Attenuator Roference 30 dB Attenuator Roference 50 dB Attenuator	4TE orlical for calibration) 4D 43941293574 MY4446007 SN: 35054(3b) SN: 35129(300) SN: 35129(300) SN: 35129(300) SN: 35129(300)	Cal Date (Certificate No.) 29-Mar-12 (No. 217-01608) 29-Mar-12 (No. 217-01608) 27-Mar-12 (No. 217-01633) 27-Mar-12 (No. 217-01632) 27-Mar-12 (No. 217-01632) 28-Das-11 (No. ES3-3013_Dec11) 10-Jan-12 (No. DAE4-060_Jan12)	Scheduled Calibration Apr 13 Apr 13 Apr 13 Apr 13 Apr 13 Apr 13 Apr 13 Dat-12 Jan-13
Calibration Equipment used (M Prenary Standards Power meter E44198 Power sensor E4412A Reference 3 dB Attenuator Reference 30 dB Attenuator Reference 30 dB Attenuator Reference 30 dB Attenuator	40 30 30 30 30 30 30 30 30 30 3	Cai Date (Certificate No.) 29-Mar-12 (No. 217-01608) 29-Mar-12 (No. 217-01608) 27-Mar-12 (No. 217-01631) 27-Mar-12 (No. 217-01632) 27-Mar-12 (No. 217-01632) 27-Mar-12 (No. 217-01632) 29-Dec-11 (No. ES3-3013_Dec11)	Scheduled Calibration Apr-13 Apr-13 Apr-13 Apr-13 Apr-13 Apr-13 Dec-12
Calibration Equipment used (M Premary Standards Power meter E44198 Power sensor E4412A Reference 30 dB Attenuator Reference 30 dB Attenuator Reference 30 dB Attenuator Reference Probe E33DV2 DAE4 Secondary Standards RF generator HP 8848C	8TE ortical for calibration) 10 39841283874 MY44490887 Src 50054 (3c) Src 50054 (3c) Src 50054 (3c) Src 5008 (20b) Src 5009 Src 500 Src 500 ID	Cal Date (Certificate No.) 29-Mar-12 (No. 217-01608) 29-Mar-12 (No. 217-01608) 27-Mar-12 (No. 217-01631) 27-Mar-12 (No. 217-01632) 27-Mar-12 (No. 217-01632) 29-Dat-11 (No. 553-3013_Dec11) 10-Jan-12 (No. DAE4-660_Jan12) Check Date (in fituate)	Scheduled Calibration Apr-13 Apr-13 Apr-13 Apr-13 Apr-13 Dac-12 Jan-13 Scheduled Chesic
Calibration Equipment used (M Prenary Standards Power meter E44188 Power sensor E4412A Reference 3 dB Attenuator Reference 30 dB Attenuator	MTE critical for calibration) ID ID ID ID ID ID ID ISN: 55054 (3c) SN: 55054 (3c) SN	Cai Date (Certificate No.) 29-Mar-12 (No. 217-01606) 29-Mar-12 (No. 217-01606) 27-Mar-12 (No. 217-01630) 27-Mar-12 (No. 217-01632) 27-Mar-12 (No. 217-01632) 28-Date-11 (No. 283-3013_Dec11) 10-Jan-12 (No. DAE4-660_Jan12) Check Date (in floure) 4-Aug-98 (in floure) 18-Oct-01 (in rease check Apr-11)	Scheduled Calibration Apr-13 Apr-13 Apr-13 Apr-13 Apr-13 Dec-12 Jan-13 Scheduled Cheek Im house check: Apr-13 Im House check: Apr-13
Calibration Equipment used (M Prenary Standards Power meter E44198 Power sensor E4412A Reference 3 dB Attenuator Reference 30 dB Attenuator Reference 30 dB Attenuator Reference 30 dB Attenuator Reference 50 dB Attenuator Reference Standards Reference From ES3DV2 DAE4 Secondary Standards RF generator HP 9648C	ID ID IGB41233574 MY4440007 SN: 35054 (3b) SN: 35054 (3b) SN: 56089 (3b) SN: 56199 (3b) SN: 5619 (3b) SN: 5619 (3b) SN: 5619 (3b) SN: 5619 (3b) SN: 5619 (3b) SN: 5619 (3b) SN: 5619 (3b) SN: 660 ID U\$3842U\$1100 U\$3330585 SN: 5619 (3b)	Cal Date (Certificate No.) 29-Mar-12 (No. 217-01508) 29-Mar-12 (No. 217-01508) 27-Mar-12 (No. 217-01508) 27-Mar-12 (No. 217-01532) 27-Mar-12 (No. 237-01532) 29-Dec-11 (No. ES3-3013_Dec11) 10-Jan-12 (No. DAE4-660_Jar-12) Check Date (in floute) 4-Aug-98 (in floute) check Apr-11)	Scheduled Calibration Apr-13 Apr-13 Apr-13 Apr-13 Apr-13 Dec-12 Jan-13 Schedwed Chese Im Pouse check: Apr-15
Calibration Equipment used (M Premary Standards Power meter E44198 Power sensor E44198 Reference 3 dB Attenuator Reference 30 dB Attenuator Reference 40 dB	ID ////////////////////////////////////	Cai Date (Certificate No.) 29-Mar-12 (No. 217-01505) 29-Mar-12 (No. 217-01505) 27-Mar-12 (No. 217-01505) 27-Mar-12 (No. 217-01532) 27-Mar-12 (No. 217-01532) 28-Das-11 (No. ES3-3013_Den11) 10-Jan-12 (No. DAE4-660_Jan12) Chack Date (in fibure) 4-Aug-99 (in fibure) 4-Aug-99 (in fibure) theory (No. 217-015) 18-Oct-01 (in rease check Oct-11) Function	Scheduled Calibration Apr-13 Apr-13 Apr-13 Apr-13 Apr-13 Dec-12 Jan-13 Scheduled Cheek Im house check: Apr-13 Im House check: Apr-13

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Calibration Laboratory of Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland



SHISS S C С s BRA

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

Accreditation No.: SCS 108

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary

Globbally.	
TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization ϕ	φ rotation around probe axis
Polarization 8	3 rotation around an axis that is in the plane normal to probe axis (at measurement center),
	i.e., 9 = 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 9 = 0 (f < 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E2-field uncertainty inside TSL (see below ConvF).
- NORM(f)x,y,z = NORMx,y,z * frequency_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCPx, y, z: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters: Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORMx,y,z * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy); in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

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ET3DV6 - SN:1782

April 27, 2012

Probe ET3DV6

SN:1782

Manufactured: April 15, 2003 Calibrated: April 27, 2012

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

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ET3DV6- SN:1782

April 27, 2012

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1782

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (µV/(V/m) ²) ^A	2.01	1.66	1.88	± 10.1 %
DCP (mV) ⁸	96.2	96.7	96.7	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc ^E (k=2)
0	CW	0.00	X	0.00	0.00	1.00	154.8	±1.9 %
			Y	0.00	0.00	1.00	185.8	
			Z	0.00	0.00	1.00	151.1	

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

⁶ The uncertainties of NomX,Y,Z do not affect the E²-field uncertainty inside TSL (see Pages 5 and 6).
⁶ Numerical linearization parameter: uncertainty not required.
^c Uncertainty is determined using the max, deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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ET3DV6- SN:1782

April 27, 2012

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1782

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^r	Conductivity (S/m)	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	43.5	0.87	7.17	7.17	7.17	0.23	2.35	± 13.4 %
835	41.5	0.90	6.40	6.40	6.40	0.32	3.00	± 12.0 %
1750	40.1	1.37	5.39	5.39	5.39	0.80	1.66	± 12.0 %
1900	40.0	1.40	5.12	5.12	5.12	0.80	1.98	± 12.0 %
2450	39.2	1.80	4.48	4.48	4.48	0.80	1.97	± 12.0 %

^C Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
⁷ At frequencies below 3 GHz, the validity of tissue parameters (s and o) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (s and o) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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ET3DV6-SN:1782

April 27, 2012

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1782

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m)	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	7.57	7.57	7.57	0.16	2.29	± 13.4 %
835	55.2	0.97	6.22	6.22	6.22	0.24	3.00	± 12.0 %
1750	53.4	1.49	4.79	4.79	4.79	0.76	2.24	± 12.0 %
1900	53.3	1.52	4.59	4.59	4.59	0.75	2.18	± 12.0 %
2450	52.7	1.95	4.11	4.11	4.11	0.76	2.25	± 12.0 %

^C Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. ⁶ At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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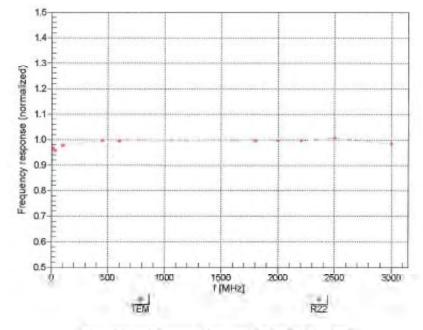
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ET3DV6- SN:1782

April 27, 2012

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



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

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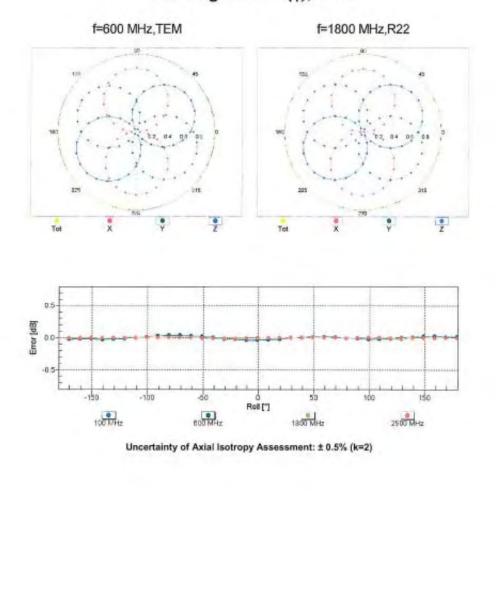
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ET3DV6- SN:1782

April 27, 2012



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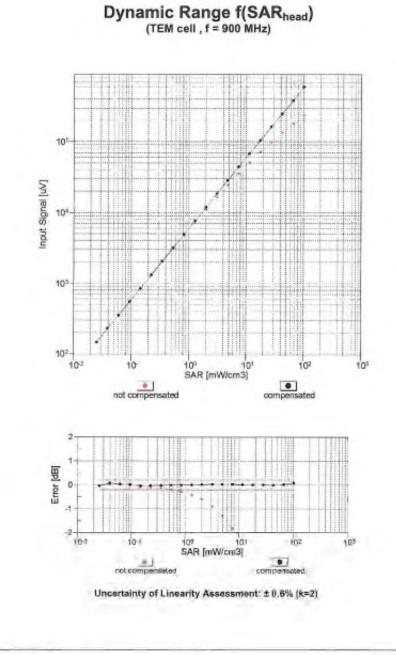
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ET3DV6- SN:1782

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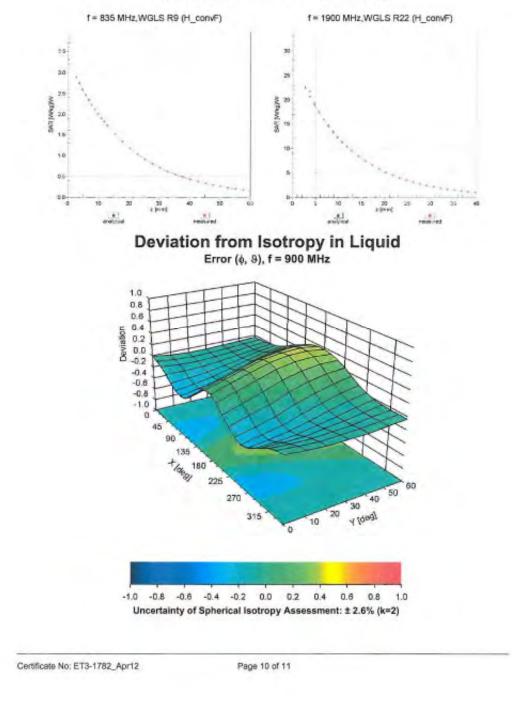
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ET3DV6- SN:1782

April 27, 2012

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1782

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (*)	49.1
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	6.8 mm
Probe Tip to Sensor X Calibration Point	2.7 mm
Probe Tip to Sensor Y Calibration Point	2.7 mm
Probe Tip to Sensor Z Calibration Point	2.7 mm
Recommended Measurement Distance from Surface	4 mm

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- PROBE Calibration Certificate (EX3DV4)

Multinateral Agreement for the	rice is one of the signatorie recognition of calibration	s to the EA	No.: SCS 108
Client SGS (Dymste			EX3-3791_May12
CALIBRATION Object	EX3DV4 - SN:37		
Calibration procedure(s)	the second se	A CAL-14.v3, QA CAL-23.v4, QA dure for dosimetric E-field probes	CAL-25.v4
Calibration date:	May 23, 2012		
The measurements and the un All calibrations have been cond	certainties with confidence pr fucted in the closed laborator	anal standards, which realize the physical units obability are given on the following pages and y facility: environment temperature (22 ± 3)°C a	are part of the certificate.
Calibration Equipment used (M	&TE critical for calibration)		
		Cal Date (Cecilicate No V	School Just Colombias
Calibration Equipment used (M Primary Stangerda Power meller E4419B	ID G841293674	Cal Dale (Certificate No.) 29-Mar-12 (No. 217-01608)	Scheduled Galamation
Primary Stancarda	10		and the second
Primary Stangarda Power miller E44108 Power senior E4412A Refirmerce 3 dB Alienuator	ID G841293674	28-Mar-12 (No. 217-01508)	Apr-13
Primary Stangarda Roser malar E44108 Power sensor 54412A Reference 3 dB Alternator Reference 20 dB Attenuator	10 10341293874 MY41468087 SNI 55054 (3c) SNI 55066 (20b)	28-Mar-12 (No. 217-01608) 29-Mar-12 (No. 217-01608) 27-Mar-12 (No. 217-01631) 27-Mar-12 (No. 217-01633)	Apr-13 Apr-13 Apr-13 Apr-13 Apr-13
Primary Stangerda Rowar mater E44108 Power senidor E4412A Refirmenta 3 dB Altenuator Reference 20 dB Attenuator Reference 30 dB Attenuator	1D G841293874 MY4148087 SNI S5054 (3c) SNI S5060 (20b) SNI S5129 (30b)	28-Mar-12 (No. 217-01608) 29-Mar-12 (No. 217-01608) 27-Mar-12 (No. 217-01631) 27-Mar-12 (No. 217-01632) 27-Mar-12 (No. 217-01632)	Арг-13 Арг-13 Арг-13 Арг-13 Арг-13 Арх-13
Primary Stangerda Rower matter E44108 Rower senter E4412A Reference 30 dB Attenuator Reference 30 dB Attenuator Reference 30 dB Attenuator Reference Probe E33DV2	1D C841293674 MY41458067 SNI S5054 (3c) SNI S5066 (2064 SNI S5129 (30b) SNI S5129 (30b) SNI 3013	29-Mar-12 (No. 217-01608) 29-Mar-12 (No. 217-01608) 27-Mar-12 (No. 217-01603) 27-Mar-12 (No. 217-01629) 27-Mar-12 (No. 217-01632) 27-Mar-12 (No. 217-01632) 29-Dec-11 (No. ESS-3013_Dec.11)	Apr-13 Apr-13 Apr-13 Apr-13 Apr-13 Apr-13 Dec-12
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Primary Stangarda Power senior E44126 Power senior E4412A Reference 20 dB Attenuator Reference 20 dB Attenuator Reference Probe E33DV2 DAE4	1D C841293674 MY41468067 SNI 55064 (3c) SNI 55066 (2064 SNI 55066 (2064) SNI 55129 (206b) SNI 55129 (206b) SNI 55129 (206b) SNI 5560	29-Mar 12 (No. 217-01608) 29-Mar 12 (No. 217-01608) 27-Mar 12 (No. 217-01691) 27-Mar 12 (No. 217-01693) 27-Mar 12 (No. 217-01653) 29-Dis-11 (No. E53-3015_Cec11) 10-Jan 12 (No. DAE4-680_Jan12)	Apr-13 Apr-13 Apr-13 Apr-13 Apr-13 Apr-13 Dec-12 Jae-13
Primary Stangarda Power sensor E44126 Power sensor E4412A Reference 20 dB Attenuator Reference 20 dB Attenuator Reference Probe E33042 DAE4 Secondary Stencarde	10 0241293674 MY41468087 SNI 55064 (3c) SNI 55069 (200) SNI 55069 (200) SNI 55129 (300) SNI 55129 (300) SNI 55129 (300) SNI 560 U	29-Mar-12 (No. 217-01608) 29-Mar-12 (No. 217-01608) 27-Mar-12 (No. 217-01601) 27-Mar-12 (No. 217-01629) 27-Mar-12 (No. 217-01629) 29-Dec-11 (No. E58-3013_Dec.11) 10-Jan-12 (No. DAE4-660_Jan12) Check Date (in thouse)	Apr-13 Apr-13 Apr-13 Apr-13 Apr-13 Dec-12 Jac-12 Jac-13 Scheduled Check
Primary Stangarda Power sensor E44108 Power sensor E44108 Reference 20 dB Attenuator Reference 20 dB Attenuator Reference Probe E330V2 DAE4 Secondary Semoarde RF generator HP 8648C	10 102 10241293874 MY4148087 SNI 55064 (3c) SNI 55066 (200) SNI 55060 (200) SNI 55020 (100) SNI 55120 (100) SNI 55120 (100) SNI 560 0 10 10 10 10 10 10 10 10 10	29-Mar-12 (No. 217-01608) 29-Mar-12 (No. 217-01608) 27-Mar-12 (No. 217-01603) 27-Mar-12 (No. 217-01629) 27-Mar-12 (No. 217-01629) 27-Mar-12 (No. 559-3013_Dec11] 10-Jan-12 (No. 559-3013_Dec11] 10-Jan-12 (No. DAE4-660_Jan12) Check Date (in fouse) 4-Aug-99 (in fouse check Apr-11)	Apr-13 Apr-13 Apr-13 Apr-13 Apr-13 Dec-12 Jac-13 Schedulled Check In noise check: Apr-13 In house check: Apr-13
Primary Stangarda Pgawar milliw E4410B Power senitor E4412A Reference 31 dB Altenuator Reference 20 dB Attenuator Reference Probe E330V2 DAE4 Secondary Semoards RF generator HP S048C National Analyzar HP 6763E	10 0341293674 MY41468067 SNI 55064 (3c) SNI 55066 (2064 SNI 55066 (2064) SNI 55129 (2064) SNI 55129 (2064) SNI 55129 (2064) SNI 55129 (2064) SNI 5680 US US3642001700 US3642001700 US3642001700	29-Mar 12 (No. 217-01508) 29-Mar 12 (No. 217-01508) 27-Mar 12 (No. 217-01503) 27-Mar 12 (No. 217-01529) 27-Mar 12 (No. 217-01529) 29-Dio-11 (No. E53-3013_Coc11) 10-Jan 12 (No. DAE4-690_stan12) Check Date (in touse) 4-Aug-99 (in house check Apr-11) 18-Oct-01 (in house check Apr-11)	Apr-13 Apr-13 Apr-13 Apr-13 Apr-13 Dec-12 Jec-13 Scheduled Check In noise check Apr-13
Pawer maker E44108 Power sensor E4410A Reference 31 dB Alternator Reference 20 dB Attenuator Reference 30 dB Attenuator Reference Probe E33042 DAE4 Secondary Stendards RF generator HP S648C	10 0241293674 MY41468067 SNI 55064 (3c) SNI 55066 (20b) SNI 55066 (20b) SNI 55129 (20b) SNI 55129 (20b) SNI 560 SNI 660 ED US3642001780 US3642001780 US3642001780 US36542001780	29-Mar-12 (No. 217-01608) 29-Mar-12 (No. 217-01608) 27-Mar-12 (No. 217-01631) 27-Mar-12 (No. 217-01633) 27-Mar-12 (No. 217-01532) 29-Dis-11 (No. ES3-3013_Dec11) 10-Jan-12 (No. DAE4-690_Jan12) Check Date (in flotuse) A-Aug-98 (in flotuse check Apr-11) 18-Oct-01 (in flotuse check Oct-11) Function	Apr-13 Apr-13 Apr-13 Apr-13 Apr-13 Dec-12 Jac-13 Schedulled Check In noise check: Apr-13 In house check: Apr-13

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





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

Accreditation No.: SCS 108

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

tissue simulating liquid TSL NORMx,y,z sensitivity in free space ConvF sensitivity in TSL / NORMx,y,z DCP diode compression point CF crest factor (1/duty_cycle) of the RF signal A, B, C modulation dependent linearization parameters Polarization ϕ o rotation around probe axis Polarization & 9 rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., 8 = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

- 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
- 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 9 = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx, y,z are only intermediate values, i.e., the uncertainties of NORMx, y,z does not affect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)x,y,z = NORMx,y,z * frequency_response (see Frequency Response Chart). This linearization is
 implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included
 in the stated uncertainty of ConvF.
- DCPx,y,z: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C are numerical linearization parameters assessed based on the data of
 power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the
 maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters: Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORMx,y,z * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy): in a field of low gradients realized using a flat phantom
 exposed by a patch antenna.
- Sensor Offset: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

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EX3DV4 - SN:3791

May 23, 2012

Probe EX3DV4

SN:3791

Manufactured: Calibrated: February 18, 2011 May 23, 2012

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

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EX3DV4-SN:3791

May 23, 2012

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3791

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (µV/(V/m) ²) ^A	0.51	0.56	0.55	± 10.1 %
DCP (mV) ^d	102.7	105.2	99.4	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc ^E (k=2)
0	CW	0.00	X	0.00	0.00	1.00	160.0	±3.5 %
			Y	0.00	0.00	1.00	129.1	
			Z	0.00	0.00	1.00	127.9	

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%.

⁶ The uncertainties of NormX, Y,Z do not affect the E²-field uncertainty inside TSL (see Pages 5 and 6).
⁹ Numerical linearization parameter: uncertainty not required.
² Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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EX3DV4- SN:3791

May 23, 2012

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3791

f (MHz) ^c	Relative Permittivity	Conductivity (S/m)	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
2600	39.0	1.96	6.37	6.37	6.37	0.33	1.00	± 12.0 %
3700	37.7	3.12	5.92	5.92	5.92	0.54	1.01	± 13.1 %
5200	36.0	4.66	4.80	4.80	4.80	0.35	1.80	± 13.1 %
5300	35.9	4.76	4.53	4.53	4.53	0.35	1.80	± 13.1 %
5500	35.6	4.96	4.50	4.50	4.50	0.38	1.80	± 13.1 %
5600	35.5	5.07	4.12	4.12	4.12	0.45	1.80	± 13.1 %
5800	35.3	5.27	4.31	4.31	4.31	0.40	1.80	± 13.1 %

Calibration Parameter Determined in Head Tissue Simulating Media

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

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EX3DV4-SN:3791

May 23, 2012

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3791

f (MHz) ^c	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
2600	52.5	2.16	6.37	6.37	6.37	0.79	0.50	± 12.0 %
3700	51.0	3.55	5.72	5.72	5.72	0.33	1.38	± 13.1 %
5200	49.0	5.30	4.00	4.00	4.00	0.50	1.90	± 13.1 %
5300	48.9	5.42	3.70	3.70	3.70	0.60	1.90	± 13.1 %
5500	48.6	5.65	3.64	3.64	3.64	0.55	1.90	± 13.1 %
5600	48.5	5.77	3.31	3.31	3.31	0.660	1.90	± 13.1 %
5800	48.2	6.00	3.79	3.79	3.79	0.60	1.90	± 13.1 %

Calibration Parameter Determined in Body Tissue Simulating Media

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

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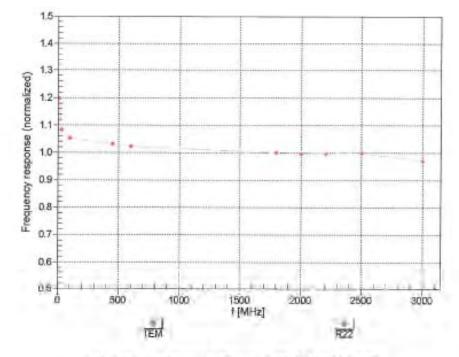
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EX3DV4- SN:3791

May 23, 2012

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



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

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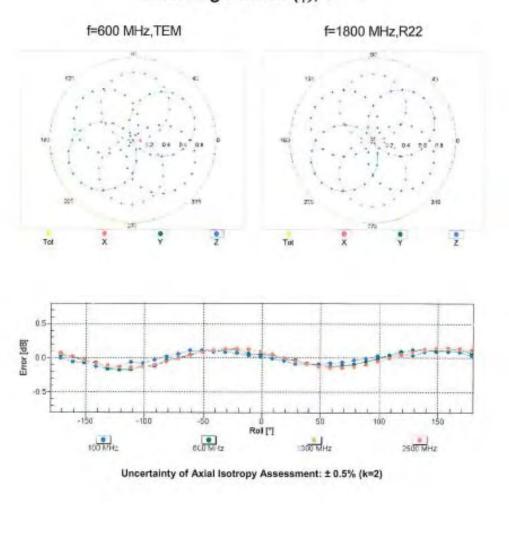
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EX3DV4-SN:3791

May 23, 2012



Receiving Pattern (ϕ), $\vartheta = 0^{\circ}$

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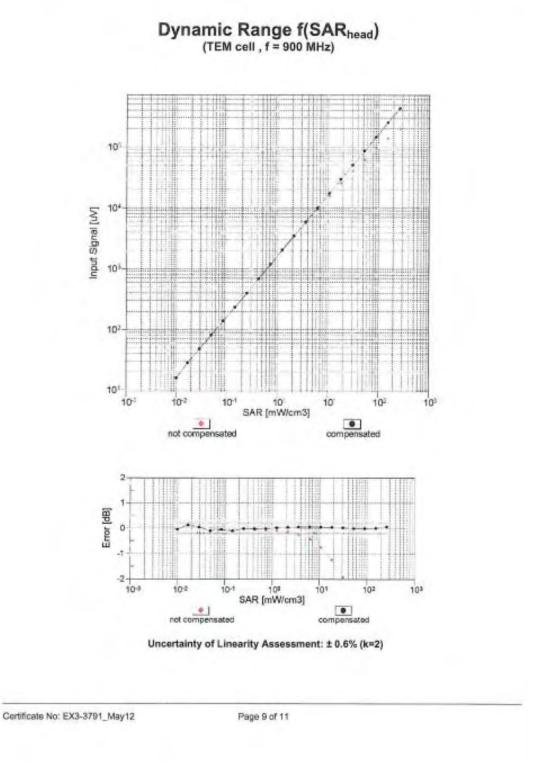
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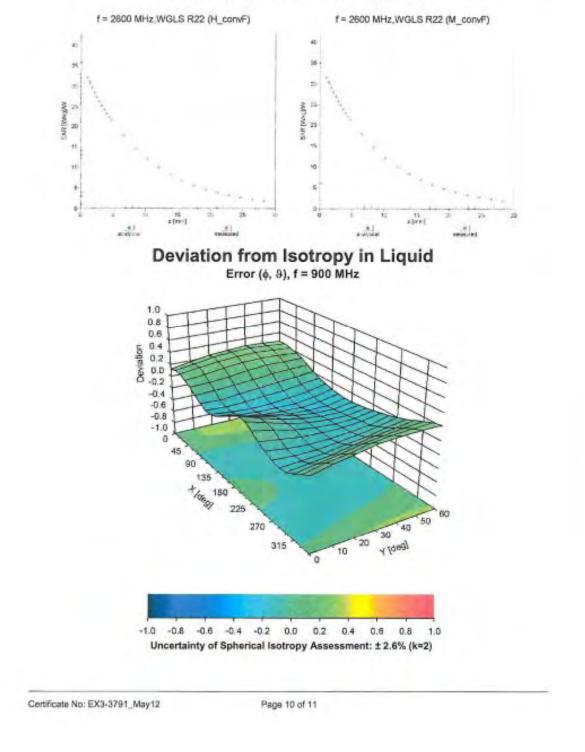
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EX3DV4-SN:3791

May 23, 2012

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3791

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	68.6
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

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-DAE 3 Calibration Certificate

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Celibration date:	January 20, 2012		
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Calibration Laboratory of Schmid & Partner Engineering AG Telepasetmes 42, 804 Zurich, Settement



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Accreditation No. SCS 109

Accession of the Assessment Accession of the signatorial in the EA. Multiment Agreement for the recognition of calibration certification

Glossary

DAE Connector angle data acquisition electronics

ngle information used in DASY system to align probe sensor X to the mbol 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 Vollage 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 aborted: 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: Typical value for information: 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.

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DC Voltage Measurement

High Frange	1L58 =	E. HLY	tuil (ange =180+300 =
Low Range:	ILSB =	GirtV.	VmC+
OASY musummon p	committees: Ala	to Zoro Time 3	noc. Measuring time: 3 sec.

Calibration Pactors	×	Ψ	2
High Range	404.783 = 0.1% (k=2)	404.411±0.1% (k=Z)	404.499±0.1% (k-2)
Low flange	3.95035 ± 0.7% (K=2)	3.97119 ± 0.7% (k=2)	$3.95014 \pm 0.7\%$ (k=2)

Connector Angle

	Connector Angle to be used in DASY system	7.51±1
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Appendix

High Range	Finading (L/V)	Dutterence (µV)	Error (%
Channel X + Impul	199996.62	3.52	0,00
Channel X + Input	20005.03	4.17	0.02
Channel X - Input	-19996.67	3.44	-0.10
Chennel Y + Imput	182997:37	2.90	0.00
Channel Y + input	19999.48	-1/11	-0.01
Channel Y - Input	-19998.88	1.52	-0.01
Channel 2 + input	T \$599984-27	-0,65	-0.00
Channel Z + Input	20001.19	0.52	0.00
Channel Z - Input	19985.78	4.48	-0.02

Low Range	Reading (µV)	Difference (µV)	Error (%)
Channel X = Input	1999.73	135	-0,87
Channel X + Input	200.29	-1.35	-0.67
Channel X - Input	-197.22	0.97	-0.49
Channel Y + Input	1999.97	-1.02	-0.05
Channel Y + Input	200.82	-0.73	-0.36
Channel Y - Input	-198.58	-0.24	0.12
Channel Z + Input	2000.13	-0.92	-0.05
Channel Z + Input	200,68	-0.79	-0.39
Channel Z - Input	+199.20	-0.95	0.48

2. Common mode sensitivity

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

	Common model Input Voltage (mV)	High Range Average Reading (µV)	Low Range Average Reading (µV)
Channel X	280	6.01	1.84
	-200	-13,55	-1:10
Channel Y	200	1.13	:2.69
	-201	1.36	1.28
Channel Z	500	4.36	4.11
	+ 200	5.62	-6.33

3. Channel separation DASY mensionent parameters: Auto Zeto Time. Sisse: Measuring time 3 sec

	Imput Voltage (mV)	Channel X (µV)	Channel Y (µV)	Channel Z (µV)
Channel X	200	× 1	-2:44	-2.08
Channel Y	200	7.42		-161
Channel Z	200	5.84	8.05	-

Gentilicale No: DAE3-597 Jan 12 Page 4 nl 5

SGS Korea Co., Ltd. (Gunpo Laboratory)



AD-Converter Values with inputs shorted D459 musurement parameters Auto Zere Time: 3 sec, Massung Ime: 3 sec.

	HigH Range (LSB)	Low Range (LSB)
Channel X	18326	15742
Channal V	18181	15582
Channel Z	15963	10228

5. Input Offset Measurement

DASY measurement parameters: Auto Zona Time: 3 sec: Measuring time: 3 sec. Input 10M2

-	Average (µ¥)	min. Offset (µV)	max. Offset (gV)	Sid. Deviation (µV)
Channel X	0.24	-1.11	1.46	0.53
Channel Y	-0.13	-2.45	1.09	0.49
Channel Z	-0,85	32,000	0,31	0.42

6. Input Offset Current

Nominal Input circuitry offset current on all channels; <251/-

7. Input Resistance (Typical values for information)

CALCULATION OF LAND	Zeroing (kDhm)	Measuring (MOtro)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values inclution)

Typical values	Alarm Level (VDC)
Supply (+ Vec)	+7.0
Supply (- Vec)	-76

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Suppry (+ Vcc)	+0.01	+0.	=14
Supply (- Vcc)	-0.01		

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- 835 Mz Dipole Calibration Certificate

and a second second second second			
Accredited by the Swiss Accredit The Swiss Accreditation Servic Multilateral Agreement for the	e is one of the signatorie	es to the EA	on No.: SCS 108
Client SGS (Dymstee			No: D835V2-490_May12
CALIBRATION (CERTIFICATI	E	
Object	D835V2 - SN: 49	90	
Calibration procedure(s)	QA CAL-05.v8	edure for dipole validation kits at	acus 700 MHz
	Calibration proce	source for upore valuation kits at	JOVE 700 MIA2
Calibration date:	May 16, 2012		
The measurements and the unce	ertainties with confidence p	ional standards, which realize the physical u robability are given on the following pages a ry facility, environment temperature (22 ± 3)	and are part of the certificate.
The measurements and the unce	ertainties with confidence p cied in the closed laborate	robability are given on the following pages a ry fecility, environment temperature (22 ± 3)	and are part of the certificate.
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Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland



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Accreditation No.: SCS 108

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

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Measurement Conditions

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

DASY Version	DASY5	V52.8.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.6 ± 6 %	0.89 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.34 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	9.39 mW /g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.53 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	6.14 mW /g ± 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.3 ± 6 %	1.00 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.40 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	9.35 mW / g ± 17.0 % (k=2)
SAR averaged over 10 cm ^a (10 g) of Body TSL	condition	
SAR averaged over 10 cm ³ (10 g) of Body TSL SAR measured	condition 250 mW input power	1.58 mW / g

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.8 Ω - 5.5 jΩ
Return Loss	- 25.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.9 Ω - 7.3 jΩ
Return Loss	- 21.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.381 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	May 19, 2003

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DASY5 Validation Report for Head TSL

Date: 16.05.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

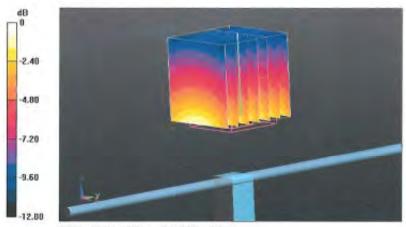
Communication System: CW; Frequency: 835 MHz Medium parameters used: f = 835 MHz; σ = 0.89 mho/m; ϵ_e = 40.6; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 SN3205; ConvF(6.07, 6.07, 6.07); Calibrated: 30.12,2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.851 V/m; Power Drift = 0.00 dB Peak SAR (extrapolated) = 3.449 mW/g SAR(1 g) = 2.34 mW/g; SAR(10 g) = 1.53 mW/g Maximum value of SAR (measured) = 2.71 mW/g



0 dB = 2.71 mW/g = 8.66 dB mW/g

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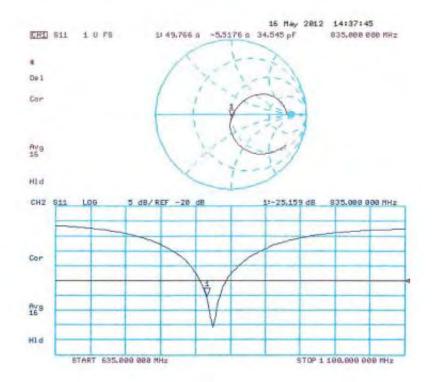


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Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL

Date: 16.05.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

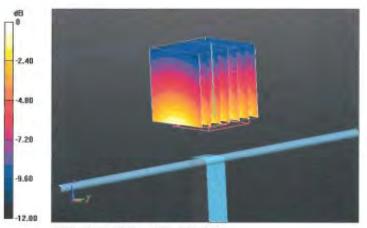
Communication System: CW; Frequency: 835 MHz Medium parameters used: f = 835 MHz; σ = 1 mho/m; ϵ_r = 54.3; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Prohe: ES3DV3 SN3205; ConvF(6.02, 6.02, 6.02); Calibrated: 30,12,2011;
- Sensor Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- · Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001.
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 54.760 V/m; Power Drift = -0.00 dB Peak SAR (extrapolated) = 3.479 mW/g SAR(1 g) = 2.4 mW/g; SAR(10 g) = 1.58 mW/g Maximum value of SAR (measured) = 2.79 mW/g



0 dB = 2.79 mW/g = 8.91 dB mW/g

Certificate No: DB35V2-490_May12

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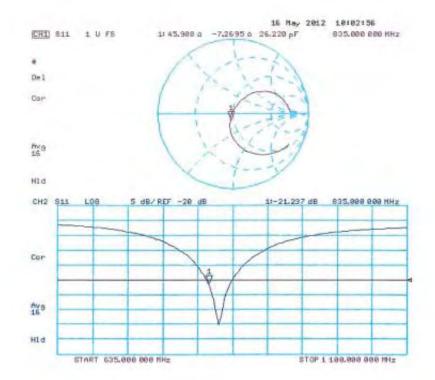


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Impedance Measurement Plot for Body TSL



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- 1900 Mz Dipole Calibration Certificate

Engineering AG eughausstrasse 43, 8004 Zuric	ry of	HAC MRA (C TZ)	S Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di faratura Swiss Calibration Service
ccredited by the Swiss Accredit he Swiss Accreditation Servic fulfilateral Agreement for the r	e is one of the signatori	es to the EA	on No.: SCS 108
Silent SGS (Dymstee	*	CC-100-600	No: D1900V2-5d033_May12
CALIBRATION	CERTIFICATI	E	
Object	D1900V2 - SN: 5	50033	
Calibration procedure(s)	QA CAL-05.v8 Calibration proce	edure for dipole validation kits at	oove 700 MHz
Calibration date:	May 23, 2012		
The measurements and the unce	rtainties with confidence p	ional standards, which realize the physical u robability are given on the following pages a ny facility: environment temperature (22 ± 3)	and are part of the certificate.
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Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





s Schweizerischer Kalibrierdienst Service suisse d'étalonnage С Servizio svizzero di taratura s

Swiss Calibration Service

Accreditation No.: SCS 108

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- · Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed . point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna ٠ connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

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

Certificate No: D1900V2-5d033_May12

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Measurement Conditions

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

DASY Version	DASY5	V52.8.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.5 ± 6 %	1.37 mha/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL

SAR averaged over 1 cm ⁸ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.69 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	39.4 mW /g ± 17.0 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR averaged over 10 cm ³ (10 g) of Head TSL SAR measured	condition 250 mW input power	5.13 mW / g

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.9 ± 6 %	1.52 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.0 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	39.9 mW / g ± 17.0 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR averaged over 10 cm ³ (10 g) of Body TSL SAR measured	condition 250 mW input power	5.31 mW / g

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.8 Ω + 3.3 jΩ
Return Loss	- 28.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.5 Ω + 3.6 jΩ
Return Loss	- 27.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.196 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 17, 2003

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DASY5 Validation Report for Head TSL

Date: 23.05.2012

Test Laboratory: SPEAG, Zurich, Switzerland

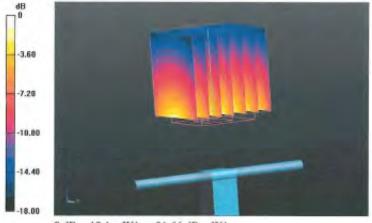
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d033

Communication System: CW; Frequency: 1900 MHz Medium parameters used: f = 1900 MHz; $\sigma = 1.37$ mho/m; $\epsilon_r = 40.5$; $\rho = 1000$ kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 SN3205; ConvF(5.01, 5.01, 5.01); Calibrated: 30.(2,2011)
- · Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Head Tissne/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 97.469 V/m: Power Drift = 0.01 dB Peak SAR (extrapolated) = 17.118 mW/g SAR(1 g) = 9.69 mW/g; SAR(10 g) = 5.13 mW/g Maximum value of SAR (measured) = 12.1 mW/g



0 dB = 12.1 mW/g = 21.66 dB mW/g

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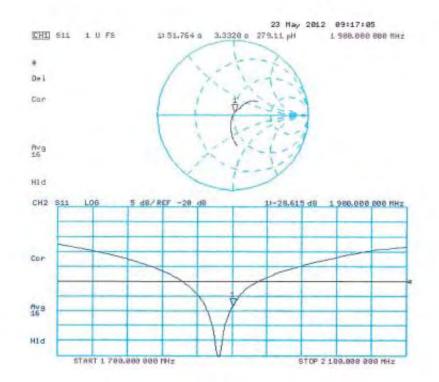


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Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL

Date: 23.05.2012

Test Laboratory: SPEAG, Zurich, Switzerland

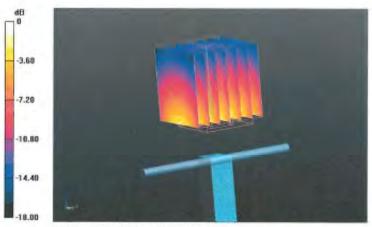
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d033

Communication System: CW; Frequency: 1900 MHz Medium parameters used: f = 1900 MHz; σ = 1.52 mho/m; e_r = 52.9; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 SN3205; ConvF(4.62, 4.62, 4.62); Calibrated: 30.12.2011;
- Sensor-Sorface: 3tom (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 94.832 V/m; Power Drift = 0.00 dB Peak SAR (extrapolated) = 17.393 mW/g SAR(1 g) = 10 mW/g; SAR(10 g) = 5.31 mW/g Maximum value of SAR (measured) = 12.7 mW/g



0 dB = 12.7 mW/g = 22.08 dB mW/g

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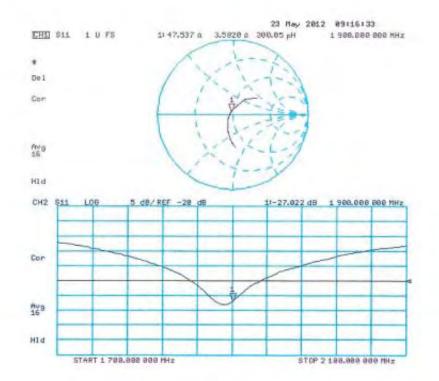


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Impedance Measurement Plot for Body TSL



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- 2450 Mz Dipole Calibration Certificate

Engineering AG ughausstrasse 43, 8004 Zuric		CONTRA (CONTRACTOR S	Servizio svizzero di taratura Swiss Calibration Service
ccredited by the Swiss Accredite he Swiss Accreditation Service			n No.: SCS 108
luitilateral Agreement for the n	ecognition of calibration		
SGS (Dymstec)	Certificate N	o: D2450V2-734_May12
CALIBRATION O	CERTIFICATE		
Object	D2450V2 - SN: 7	/34	
Calibration procedure(s)	QA CAL-05.v8 Calibration proce	dure for dipole validation kits ab	ove 700 MHz
Celibration date:	May 17, 2012		
The measurements and the unce	maintres with confidence p	ional standards, which realize the physical un mbability are given on the following cooper ar- ny facility: environment temperature (22 ± 3)*	nd are part of the cartificate.
The measurements and the unce All calibrations have been conclu	entainities with confidence p sted in the closed laborato	robability are given on the totowing bages are ry lability: environment temperature (22 \pm 3)*	nd are part of the cartificate.
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Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland



NIS.

BRA

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

Accreditation No.: SCS 108

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

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Measurement Conditions

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

DASY Version	DASY5	V52.8.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.3 ± 6 %	1.85 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.3 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	52.8 mW /g ± 17.0 % (k=2)
SAR averaged over 10 cm ² (10 g) of Head TSL	condition	
SAR averaged over 10 cm ³ (10 g) of Head TSL SAR measured	condition 250 mW input power	6.19 mW / g

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.3 ± 6 %	1.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.7 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	50.2 mW / g ± 17.0 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR averaged over 10 cm ³ (10 g) of Body TSL SAR measured	condition 250 mW input power	5.95 mW /g

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.3 Ω + 3.6 jΩ
Return Loss	- 26.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.9 Ω + 5.1 jΩ	
Return Loss	- 25.8 dB	

General Antenna Parameters and Design

Electrical Delay (one direction)	1.153 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	May 07, 2003

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DASY5 Validation Report for Head TSL

Date: 17.05.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 734

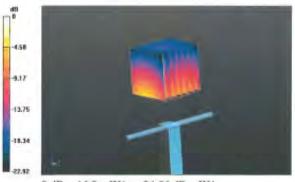
Communication System: CW; Frequency: 2450 MHz Medium parameters used: f = 2450 MHz; $\sigma = 1.85$ mho/m; $\varepsilon_r = 40.3$; $\rho = 1000$ kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 30.12.2011;
- · Sensor-Surface: 3mm (Mechanica) Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: (00)
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 97.190 V/m; Power Drift = 0.08 dB Peak SAR (extrapolated) = 27.316 mW/g SAR(1 g) = 13.3 mW/g; SAR(10 g) = 6.19 mW/g

Maximum value of SAR (measured) = 16.9 mW/g



0 dB = 16.9 mW/g = 24.56 dB mW/g

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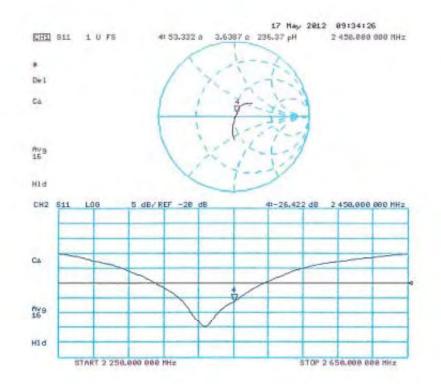


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Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL

Date: 15.05.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 734

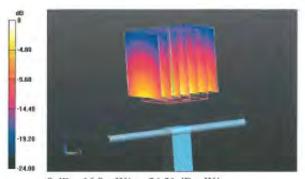
Communication System: CW; Frequency: 2450 MHz Medium parameters used: f = 2450 MHz; $\sigma = 1.99$ mho/m; $\epsilon_r = 52.3$; $\rho = 1000$ kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 SN3205; ConvF(4.26, 4.26, 4.26); Calibrated: 30.12.2011;
- · Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07,2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002.
- DASY52.52.8.1(838); SEMCAD X 14.6.5(6469)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 95 201 V/m, Power Drifi = 0.02 dB Peak SAR (extrapolated) = 25.791 mW/g SAR(1 g) = 12.7 mW/g; SAR(10 g) = 5.95 mW/g Maximum value of SAR (measured) = 16.8 mW/g



0 dB = 16.8 mW/g = 24.51 dB mW/g

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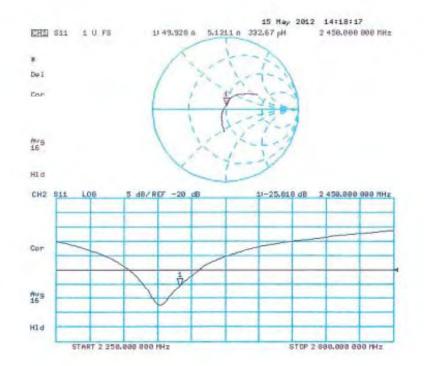


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Impedance Measurement Plot for Body TSL



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-5 GHz Dipole Calibration Certificate (5.2 GHz, 5.5 GHz, 5.8 GHz)

Calibration Laborat Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zeughausstrasse 43,	Hac-MRA	SHISS CR Z Z REARING S	Condes sulars differences	
	clitation Service (SAS) vice is one of the signatories to the EA recognition of calibration certificates	Accreditation	Accreditation No.: SCS 108	
Client SGS (Dymst	ec)	Certificate No: D5GHzV2-1130_Jul1		
CALIBRATION	CERTIFICATE			
Object	D5GHzV2 - SN: 1130			
Calibration procedure(s)	QA CAL-22.v1 Calibration procedure for dipol	le validation kits bet	tween 3-6 GHz	
Calibration date:	July 02, 2012			

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)*C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.2 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe EX3DV4	SN: 3503	30-Dec-11 (No. EX3-3503_Dec11)	Dec-12
DAE4	SN: 901	05-Jun-12 (No. DAE4-901_Jun12)	Jun-13
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12
	Name	Function	Signature
Calibrated by:	Iarae El-Naouq	Laboratory Technician	Inrew El Daoug
Approved by:	Katja Pokovic	Technical Manager	Lelle-
This calibration certificate shall no	t be reproduced except in	full without written approval of the laborator	Issued: July 3, 2012 y.

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



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

Accreditation No.: SCS 108

Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

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) IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010
- b) 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:

c) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

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Measurement Conditions

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

DASY Version	DASY5	V52.8.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
	5200 MHz ± 1 MHz	
Frequency	5500 MHz ± 1 MHz	
	5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.6 ± 6 %	4.53 mha/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.25 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	82.3 mW /g ± 19.9 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR averaged over 10 cm ³ (10 g) of Head TSL SAR measured	condition 100 mW input power	2.37 mW / g

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.2 ± 6 %	4.82 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.68 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	86.5 mW / g ± 19.9 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR averaged over 10 cm ³ (10 g) of Head TSL SAR measured	condition 100 mW input power	2.48 mW / g

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Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.8 ± 6 %	5.14 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.17 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	81.4 mW / g ± 19.9 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR averaged over 10 cm ³ (10 g) of Head TSL SAR measured	condition 100 mW input power	2.33 mW / g

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Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.0 ± 6 %	5.37 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.57 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	75.1 mW / g ± 19.9 % (k=2)
SAR averaged over 10 cm ⁸ (10 g) of Body TSL	condition	
SAR averaged over 10 cm ³ (10 g) of Body TSL SAR measured	condition 100 mW input power	2.11 mW / g

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mha/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.5 ± 6 %	5.76 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.94 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	78.7 mW / g ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.20 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	21.8 mW / g ± 19.5 % (k=2)

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Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.0 ± 6 %	6.16 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.53 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	74.7 mW / g ± 19.9 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR averaged over 10 cm ³ (10 g) of Body TSL SAR measured	condition 100 mW input power	2.08 mW / g
		2.08 mW / g 20.6 mW / g ± 19.5 % (k=2)

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Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	51.3 Ω - 8.7 jΩ
Return Loss	- 21.3 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	52.5 Ω - 3.9 jΩ
Return Loss	- 27.0 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	56.2 Ω - 2.6 jΩ
Return Loss	- 23.9 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	51.3 Ω - 6.3 jΩ	
Return Loss	- 24.0 dB	

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	53.5 Ω - 1.8 μΩ
Return Loss	- 28.5 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	57.8 Ω - 0.6 jΩ
Return Loss	- 22.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.204 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 08, 2011

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DASY5 Validation Report for Head TSL

Date: 02.07.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1130

Communication System: CW; Frequency: 5200 MHz, Frequency: 5500 MHz, Frequency: 5800 MHz Medium parameters used: f = 5200 MHz; σ = 4.53 mho/m; ϵ_r = 35.6; ρ = 1000 kg/m³, Medium parameters used: f = 5500 MHz; σ = 4.82 mho/m; ϵ_r = 35.2; ρ = 1000 kg/m³, Medium parameters used: f = 5800 MHz; σ = 5.14 mho/m; ϵ_r = 34.8; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 SN3503; ConvF(5.41, 5.41, 5.41); Calibrated: 30.12.2011, ConvF(4.91, 4.91, 4.91); Calibrated: 30.12.2011, ConvF(4.81, 4.81, 4.81); Calibrated: 30.12.2011;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn901; Calibrated: 05.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 64.320 V/m; Power Drift = 0.08 dB Peak SAR (extrapolated) = 30.540 mW/g SAR(1 g) = 8.25 mW/g; SAR(10 g) = 2.37 mW/g Maximum value of SAR (measured) = 18.4 mW/g

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 63.390 V/m; Power Drift = 0.05 dB Peak SAR (extrapolated) = 34.226 mW/g SAR(1 g) = 8.68 mW/g; SAR(10 g) = 2.48 mW/g Maximum value of SAR (measured) = 19.9 mW/g

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 61.462 V/m; Power Drift = 0.07 dB Peak SAR (extrapolated) = 33.777 mW/g SAR(1 g) = 8.17 mW/g; SAR(10 g) = 2.33 mW/g Maximum value of SAR (measured) = 19.1 mW/g

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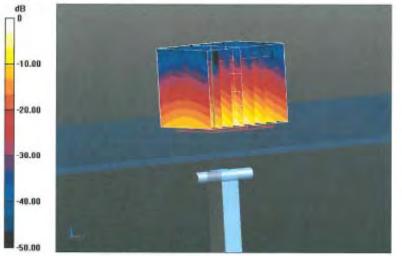
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0 dB = 19.1 mW/g = 25.62 dB mW/g

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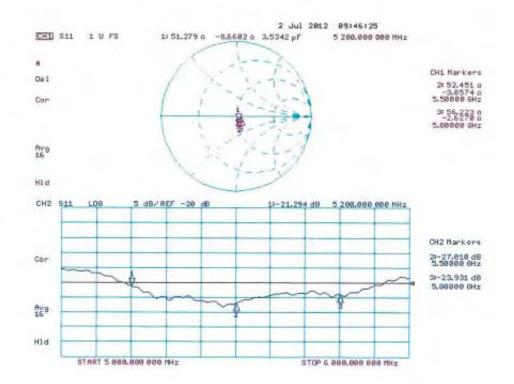


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Impedance Measurement Plot for Head TSL



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DASY5 Validation Report for Body TSL

Date: 29.06.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1130

Communication System: CW; Frequency: 5200 MHz, Frequency: 5500 MHz, Frequency: 5800 MHz Medium parameters used: f = 5200 MHz; σ = 5.37 mho/m; ϵ_r = 47; ρ = 1000 kg/m³, Medium parameters used: f = 5500 MHz; σ = 5.76 mho/m; ϵ_r = 46.5; ρ = 1000 kg/m³, Medium parameters used: f = 5800 MHz; σ = 6.16 mho/m; ϵ_r = 46; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 SN3503; ConvF(4.91, 4.91, 4.91); Calibrated: 30.12.2011, ConvF(4.43, 4.43, 4.43); Calibrated: 30.12.2011, ConvF(4.38, 4.38, 4.38); Calibrated: 30.12.2011;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn901; Calibrated: 05.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 58.928 V/m; Power Drift = -0.01 dB Peak SAR (extrapolated) = 30.342 mW/g SAR(1 g) = 7.57 mW/g; SAR(10 g) = 2.11 mW/g Maximum value of SAR (measured) = 18.1 mW/g

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 58.679 V/m; Power Drift = 0.01 dB Peak SAR (extrapolated) = 34.309 mW/g SAR(1 g) = 7.94 mW/g; SAR(10 g) = 2.2 mW/g Maximum value of SAR (measured) = 19.5 mW/g

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 55.550 V/m; Power Drift = 0.00 dB Peak SAR (extrapolated) = 35.601 mW/g SAR(1 g) = 7.53 mW/g; SAR(10 g) = 2.08 mW/g Maximum value of SAR (measured) = 19.1 mW/g

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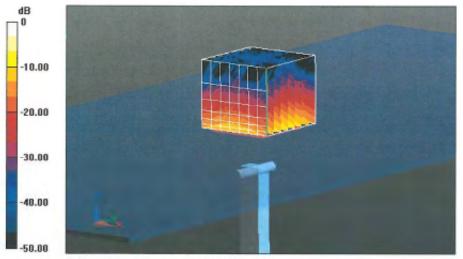
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0 dB = 19.1 mW/g = 25.62 dB mW/g

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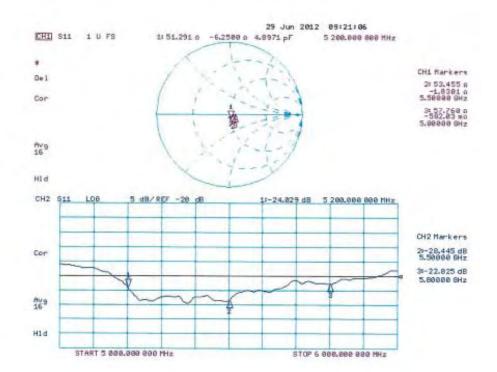


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Impedance Measurement Plot for Body TSL



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