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)

Standards: **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:

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	:	**Minhyuk Han**	**2012-11-08**
Approved by	:	**Feel Jeong**	**2012-11-08**

Contents

APPENDIX

1. General Information

1.1 Testing Laboratory

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Homepage : All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx

1.2 Details of Applicant

Applicant : Novatel Wireless
Address : 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
Tx Frequency Range	824.70 ㎒ ~ 848.31 ㎒ (DCN. CDMA/EVDE) 1851.25 ㎒ ~ 1908.75 ㎒ (PCS. CDMA/EVDO) 2412 ㎒~ 2462 ㎒ (WLAN_11b/g/n) 5180 ㎒ ~ 5240 ㎒, 5260 ㎒ ~ 5320 ㎒ (WLAN_11a/n) 5500 ㎒ ~ 5700 ㎒, 5745 ㎒ ~ 5825 ㎒ (WLAN_11a/n) 2402 ㎒ ~ 2480 ㎒ (Bluetooth)
Conducted Max Power	24.57 dB m (DCN. CDMA), 24.38 dB m (PCS. CDMA) 16.39 dB m (WLAN_2.4 ㎓), 11.74 dB m (WLAN_5.2 ㎓) 11.94 dB m (WLAN_5.3 ㎓), 15.56 dB m (WLAN_5.5 ㎓) 13.78 dB m (WLAN_5.8 ㎓), 0.94 dB m (Bluetooth)

1.5 Test Environment

Ambient temperature	: (22 ± 2) ° C
Tissue Simulating Liquid	: (22 ± 2) ° 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.

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 one-dimensional 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, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

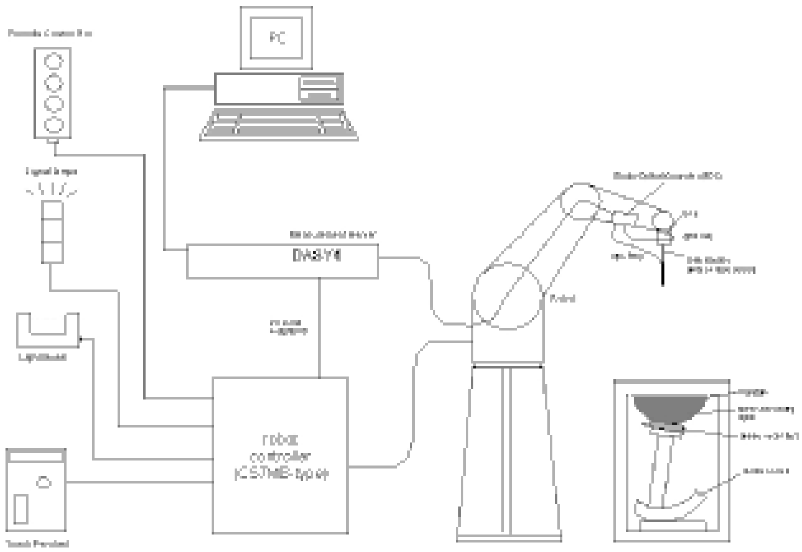


Fig a. The microwave circuit arrangement used for SAR system verification

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

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

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

• A computer operating Windows 2000 or Windows XP.

• DASY4 software.

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

• The 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.

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 ㎒ to 2.5 ㎓ In brain simulating tissue (accuracy ± 8 %)
Frequency	:	10 ㎒ to >6 ㎓; Linearity: ±0.2 ㏈ (30 ㎒ to 3 ㎓)
Directivity	:	±0.2 ㏈ in brain tissue (rotation around probe axis) ±0.4 ㏈ in brain tissue (rotation normal to probe axis)
Dynamic Range	:	5 µW/g to >100 mW/g; Linearity: ±0.2 ㏈
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 ㎓ 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 ㎒ to 6 ㎓; Linearity: ± 0.2 ㏈ (30 ㎒ to 6 ㎓)
Directivity	:	± 0.3 ㏈ in HSL (rotation around probe axis) ± 0.5 ㏈ in tissue material (rotation normal to probe axis)
Dynamic Range	:	10µW/g to > 100 m W/g; Linearity: ± 0.2 ㏈(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 ㎓ 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.

ELI Phantom

Construction: Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 ㎒ to 6 ㎓. 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

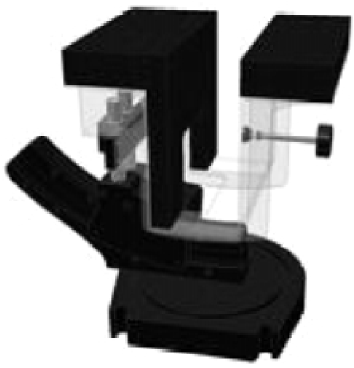
ELI Phantom

Shell Thickness: 2.0 mm ± 0.2 mm

Dimensions: Major axis: 600 ㎜
Minor axis: 400 ㎜

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 +/- 10 % from the target SAR values. These tests were done at 835 ㎒, 1900 ㎒, 2450 ㎒, 5200 ㎒, 5500 ㎒ and 5800 ㎒. 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 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.

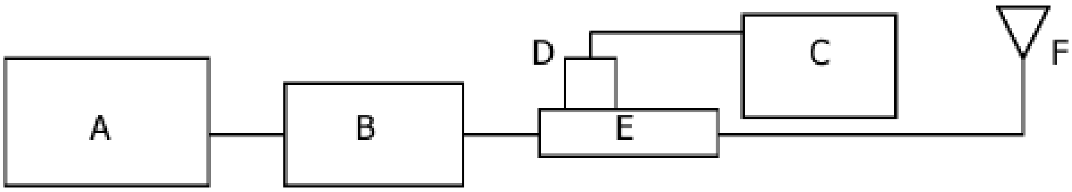


Fig b. The microwave circuit arrangement used for SAR system verification

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

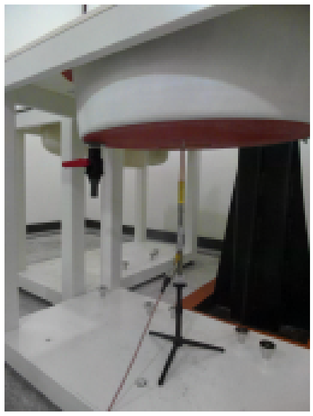


Photo of the dipole Antenna

System Validation 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 ㎒ 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 ㎒ 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 ㎒ Body	50.2 W/kg	5.12 W/kg	**51.2 W**/kg	1.99	2012-10-10	22.2
D5 ㎓ V2 S/N: 1023	5200 ㎒ Body	75.1 W/kg	7.96 W/kg	**79.6 W**/kg	5.99	2012-10-11	22.8
D5 ㎓ V2 S/N: 1023	5200 ㎒ Body	75.1 W/kg	7.86 W/kg	**78.6 W**/kg	4.66	2012-10-12	22.9
D5 ㎓ V2 S/N: 1106	5500 ㎒ Body	78.7 W/kg	8.15 W/kg	**81.5 W**/kg	3.56	2012-10-13	22.2
D5 ㎓ V2 S/N: 1106	5800 ㎒ Body	74.7 W/kg	7.71 W/kg	**77.1 W**/kg	3.21	2012-10-14	22.7

Table 1. Results system validation

1.12 Tissue Simulant Fluid for the Frequency Band

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

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

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

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 (% by weight)	Frequency (㎒)									
	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

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 MΩ^{+} resistivity   HEC: Hydroxyethyl Cellulose

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

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

1.13 Test Standards and Limits

According to FCC 47CFR §2.1093(d) The limits to be used for evaluation are based generally on criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (‘‘SAR’’) in Section 4.2 of ‘‘IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 ㎑ to 300 ㎓,’’ ANSI/IEEE C95.3–2003, Copyright 2003 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in ‘‘Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields,’’ NCRP Report No. 86, Section 17.4.5. Copyright NCRP, 1986, Bethesda, Maryland 20814. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards. The criteria to be used are specified in paragraphs (d)(1) and (d)(2) of this section and shall apply for portable devices transmitting in the frequency range from 100 ㎑ to 6 ㎓. Portable devices that transmit at frequencies above 6 ㎓ 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 ㎓ should be made at a minimum distance of 5 cm from the radiating source.

(1) Limits for Occupational/Controlled exposure: 0.4 W/㎏ as averaged over the whole-body and spatial peak SAR not exceeding 8 W/㎏ 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/㎏, 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/㎏ as averaged over the whole-body and spatial peak SAR not exceeding 1.6 W/㎏ 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/㎏, 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

2. Instruments List

Maunfacturer	Device	Type	Serial Number	Due date of Calibration
Stäubli	Robot	RX90BL	F03/5W05A1/A/01	N/A
Schmid& Partner Engineering AG	Dosimetric E-Field Probe	ET3DV6	1782	April 27, 2013
Schmid& Partner Engineering AG	Dosimetric E-Field Probe	EX3DV4	3791	May 23, 2013
Schmid& Partner Engineering AG	835 ㎒ System Validation Dipole	D835V2	490	May 16, 2014
Schmid& Partner Engineering AG	1900 ㎒ System Validation Dipole	D1900V2	5d033	May 23, 2014
Schmid& Partner Engineering AG	2450 ㎒ System Validation Dipole	D2450V2	734	January 19, 2014
Schmid& Partner Engineering AG	5000 ㎒ System Validation Dipole	D5 ㎓ 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

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 SCH_0 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.

Parameters for Max. Power for RC1

Parameter	Units	Value
I_{or}	dBm/1.23 MHz	-104
$\frac{\text{Pilot } E_c}{I_{or}}$	dB	-7
$\frac{\text{Traffic } E_c}{I_{or}}$	dB	-7.4

Table .2

Parameters for Max. Power for RC3

Parameter	Units	Value
I_{or}	dBm/1.23 MHz	-86
$\frac{\text{Pilot } E_c}{I_{or}}$	dB	-7
$\frac{\text{Traffic } E_c}{I_{or}}$	dB	-7.4

Table .3

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)
DCN	1013	824.70	24.05	24.09
	384	835.52	24.02	24.12
	777	848.31	23.92	24.01
PCS	25	1851.25	24.24	24.20
	600	1880.00	24.16	24.17
	1175	1908.75	23.97	24.01

CDMA2000 1xEVDO

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

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

5.2 ㎓

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

5.3 ㎓

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

5.5 ㎓

Mode	Freq. (㎒)	Ch. #	Rate	Measured Power [dB m]	
				Main	AUX
802.11a	5500	100	6	12.55	11.21
	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
	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
802.11n HT20	5500	100	HT0	11.74	10.45
	5520	104	HT0	11.77	10.24
	5540	108	HT0	11.76	10.02
	5560	112	HT0	11.21	9.09
	5580	116	HT0	10.62	8.74
	5600	120	HT0	10.84	8.65
	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
802.11n HT40	5510	102	HT7	10.77	9.65
	5550	110	HT7	10.84	9.26
	5590	118	HT7	9.71	7.82
	5630	130	HT7	10.25	8.23
	5670	134	HT7	12.77	9.82
802.11n HT20_MIMO	5500	100	HT8	11.39	10.23
	5520	104	HT8	11.36	9.77
	5540	108	HT8	11.29	9.45
	5560	112	HT8	10.42	8.52
	5580	116	HT8	10.12	8.23
	5600	120	HT8	10.35	8.44
	5620	124	HT8	10.38	8.26
	5640	128	HT8	11.25	8.70
	5660	132	HT8	13.12	10.23
	5680	136	HT8	13.69	10.41
	5700	140	HT8	13.75	10.62

Mode	Freq. (㎒)	Ch. #	Rate	Measured Power [dB m]	
				Main	AUX
802.11n HT40_MIMO	5510	102	HT8	10.32	9.25
	5550	110	HT8	10.52	8.59
	5590	118	HT8	8.81	7.32
	5630	126	HT8	9.32	7.62
	5670	134	HT8	11.86	9.22

5.8 ㎓

Mode	Freq. (㎒)	Ch. #	Rate	Measured Power [dB m]	
				Main	AUX
802.11a	5745	149	6	12.56	10.37
	5765	153	6	12.30	10.04
	5785	157	6	11.65	9.52
	5805	161	6	12.50	10.32
	5825	165	6	14.18	10.46
802.11n HT20	5745	149	HT0	11.52	9.42
	5765	153	HT0	11.12	9.22
	5785	157	HT0	10.72	8.71
	5805	161	HT0	11.92	9.27
	5825	165	HT0	12.71	9.31
802.11n HT40	5755	151	HT7	10.12	8.32
	5795	159	HT7	9.70	7.21
11n_20 MIMO	5745	149	HT8	11.20	8.94
	5765	153	HT8	10.48	8.55
	5785	157	HT8	10.33	8.31
	5805	161	HT8	11.12	8.56
	5825	165	HT8	12.31	8.49
11n_40 MIMO	5755	151	HT8	10.13	7.65
	5795	159	HT8	9.22	7.21

Note :

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

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

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 Transmitting Antennas	SAR not required: antenna-to-antenna or antenna-to-person distance ≥ 5 cm	SAR not required: antenna-to-antenna ≥ $(5 + ½\cdot n_x + ½\cdot n_y)$ and antenna-to-person ≥ $(5 + ½\cdot n_x)$ cm
	SAR not required: when $\Sigma (SAR_{1g}) <$ 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	

<Summary of SAR Evaluation Requirements>

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

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

MIMO: SAR not required

IEEE 802.11 Transmitters

802.11 a/b/g and 4.9 ㎓ 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 ~ 5.25 ㎓ band, channels 52 and 64 in the 5.25 ~ 5.35 ㎓ band, channels 104, 116, 124 and 136 in the 5.470 ~ 5.725 ㎓ band, and channels 149 and 161 in the 5.8 ㎓ band. When 5.8 ㎓ §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 ㏈ higher than the 802.11b mode.

Mode		GHz	Channel	Turbo Channel	"Default Test Channels"			
					§15.247		UNII	
					802.11b	802.11g		
802.11 b/g		2.412	1[#]		√	∇		
		2.437	6	6	√	∇		
		2.462	11[#]		√	∇		
802.11a	UNII	5.18	36	42 (5.21 GHz)			√	
		5.20	40					●
		5.22	44					●
		5.24	48	50 (5.25 GHz)			√	
		5.26	52				√	
		5.28	56	58 (5.29 GHz)				●
		5.30	60					●
		5.32	64				√	
		5.500	100	Unknown				●
		5.520	104				√	
		5.540	108					●
		5.560	112					●
		5.580	116				√	
		5.600	120					●
		5.620	124				√	
		5.640	128					●
		5.660	132					●
		5.680	136				√	
		5.700	140					●
	UNII or §15.247	5.745	149		√		√	
		5.765	153	152 (5.76 GHz)		●		●
		5.785	157		√			●
		5.805	161	160 (5.80 GHz)		●	√	
	§15.247	5.825	165		√			

- √ = "default test channels"
- ● = possible 802.11a 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 ㎓ WIFI SAR (W/kg)	∑SAR (W/kg)
Body SAR	Base	0.004	0.011	0.015
	configuration	DCN CDMA SAR(W/kg)	5.0 ㎓ WIFI SAR (W/kg)	∑SAR (W/kg)
	Base	0.004	0.031	0.035
	configuration	PCS CDMA SAR(W/kg)	2.4 ㎓ WIFI SAR (W/kg)	∑SAR (W/kg)
	Base	0.009	0.011	0.020
	configuration	DCN CDMA SAR(W/kg)	5.0 ㎓ 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.

3.5 SAR Data Summary

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

DCN CDMA Body Test

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

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

PCS. CDMA Body Test

Mode	Freq. (㎒)	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 ㎓ Body Test

Mode	Freq. (㎒)	Ch. #	Rate	Position	Measured Power [㏈ m]		SAR 1g (W/kg)	
					Main	AUX	Main	AUX
802.11b	2412	1	1	Base	15.22	14.67	0.005	Note:9
	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 ㏈ 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/㎏ and the frequency range is < 100 ㎒.
7. The modes with highest output power channel were chosen for the conducted output power.

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

5.2 ㎓ Body Test

Mode	Freq. (㎒)	Ch. #	Rate	Position	Measured Power [dB m]		SAR 1g (W/kg)	
					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 ㏈ 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/㎏ and the frequency range is < 100 ㎒.
7. The modes with highest output power channel were chosen for the conducted output power.

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

5.3 ㎓ Body Test

Mode	Freq. (㎒)	Ch. #	Rate	Position	Measured Power [dB m]		SAR 1g (W/kg)	
					Main	AUX	Main	AUX
802.11a	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 ㏈ 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/㎏ and the frequency range is < 100 ㎒.
7. The modes with highest output power channel were chosen for the conducted output power.

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

5.5 ㎓ Body Test

Mode	Freq. (㎒)	Ch. #	Rate	Position	Measured Power [dB m]		SAR 1g (W/kg)	
					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 ㏈ 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/㎏ and the frequency range is < 100 ㎒.
7. The modes with highest output power channel were chosen for the conducted output power.

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

5.8 ㎓ Body Test

Mode	Freq. (㎒)	Ch. #	Rate	Position	Measured Power [dB m]		SAR 1g (W/kg)	
					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 ㏈ 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/㎏ and the frequency range is < 100 ㎒.
7. The modes with highest output power channel were chosen for the conducted output power.

Appendix

List

Appendix A	DASY4 Report (Plots of the SAR Measurements)	- 835 ㎒ Validation Test - 1900 ㎒ Validation Test - 2450 ㎒ Validation Test - 5200 ㎒ Validation Test - 5500 ㎒ Validation Test - 5800 ㎒ Validation Test - CDMA Test - WLAN Test
Appendix B	Uncertainty Analysis	
Appendix C	Calibration Certificate	- PROBE - DAE3 - DIPOLE

Appendix A

Test Plot - DASY4 Report

835 ㎒ Validation Test_Body

Date: 2012-10-16

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: Validation 835 MHz_Body.da4

Input Power : 100 mW

Ambient Temp : 23.2 ℃ Tissue Temp : 22.0℃

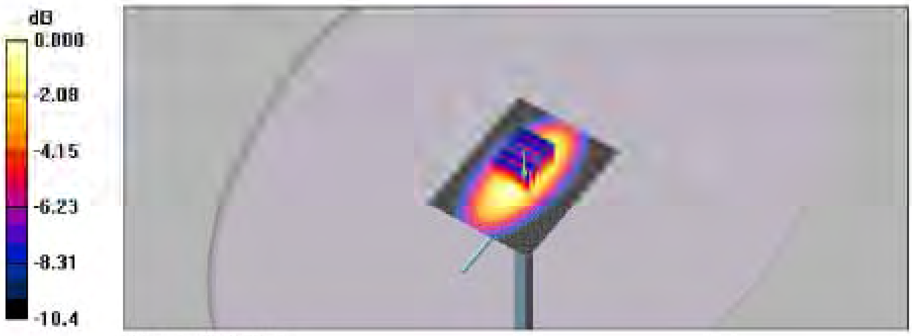
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:490
Program Name: Vaildation 835 MHz_Body

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.966 mho/m; ε_r = 56; ρ = 1000 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

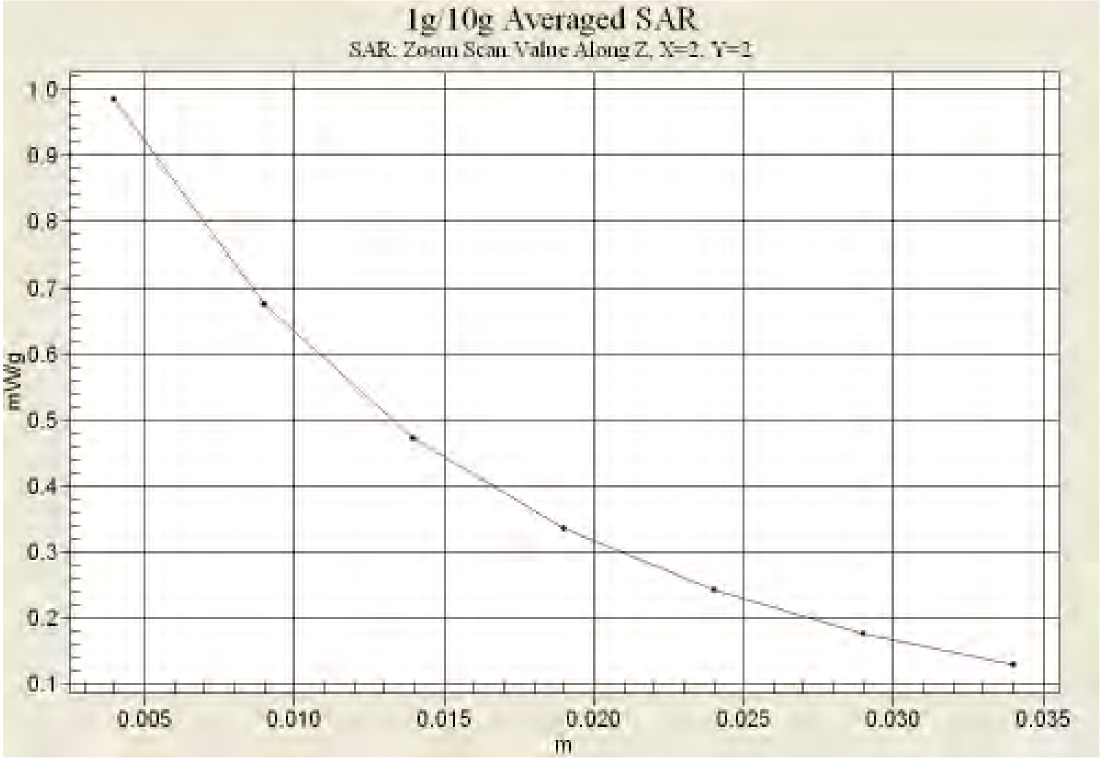
Validation 835 MHz_Body/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.991 mW/g

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



0 dB = 0.985mW/g

Z-Scan


1g/10g Averaged SAR
SAR: Zoom Scan Value Along Z, X=2, Y=2
mW/g
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

1900 ㎒ Validation Test_Body

Date: 2012-10-17

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: Validation 1900 MHz_Body.da4

Input Power : 100 mW

Ambient Temp : 23.7 ℃ Tissue Temp : 22.9℃

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

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.52 mho/m; ε_r = 54.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

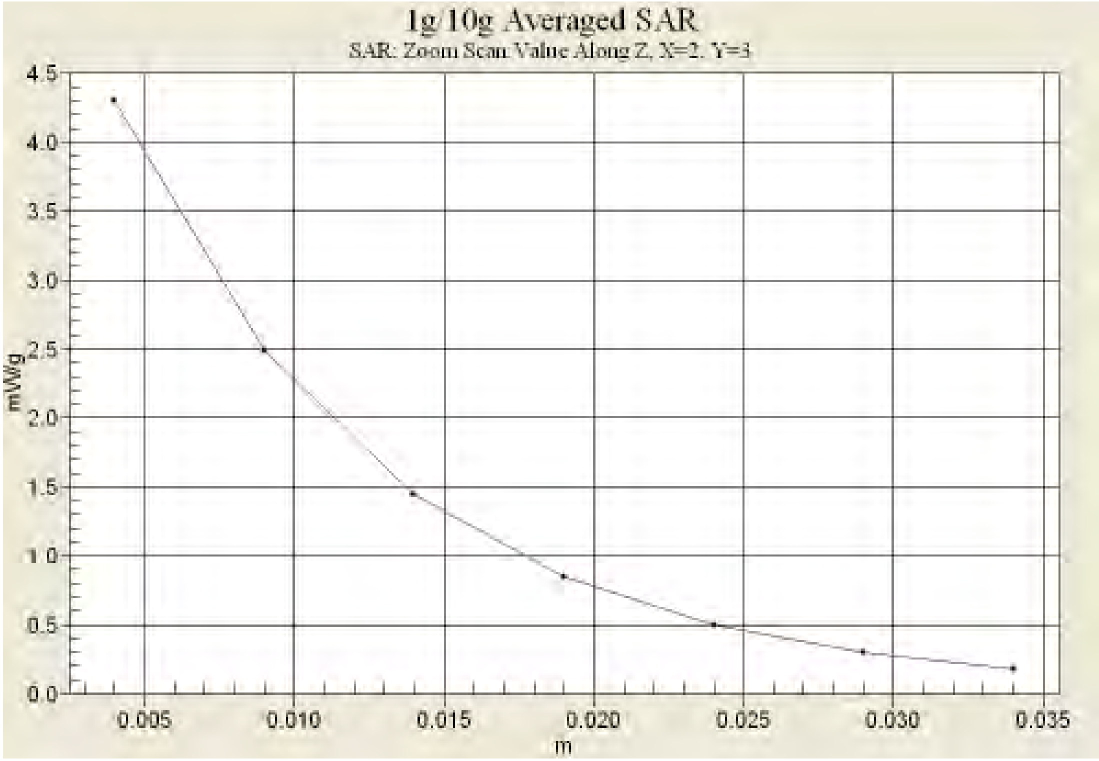
DASY4 Configuration:
- Probe: ET3DV6 - SN1782; ConvF(4.59, 4.59, 4.59); Calibrated: 2012-04-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2012-01-20
- Phantom: ELI 4.0_12_05_30; Type: QDOVA001BA; Serial: 1169
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing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

0 dB = 4.30mW/g

Z-Scan


1g/10g Averaged SAR
SAR: Zoom Scan Value Along Z, X=2, Y=3
mW/g
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

2450 ㎒ Validation Test_Body

Date: 2012-10-10

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: Validation 2450 MHz_Body.da4

Input Power : 100 mW

Ambient Temp : 23.4 ℃ Tissue Temp : 22.2℃

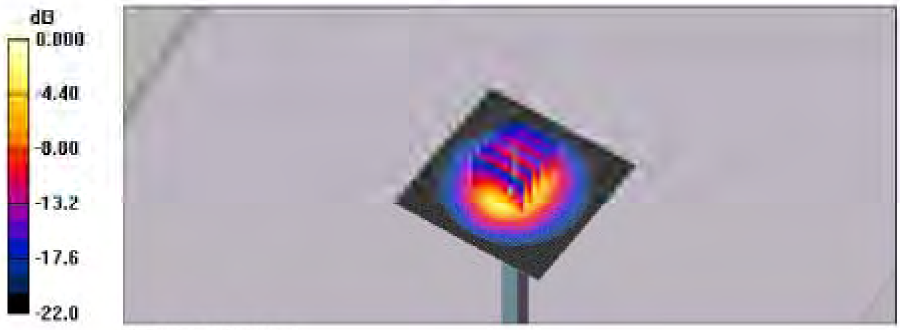
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:746
Program Name: Validation 2450 MHz_Body

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/m^3
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

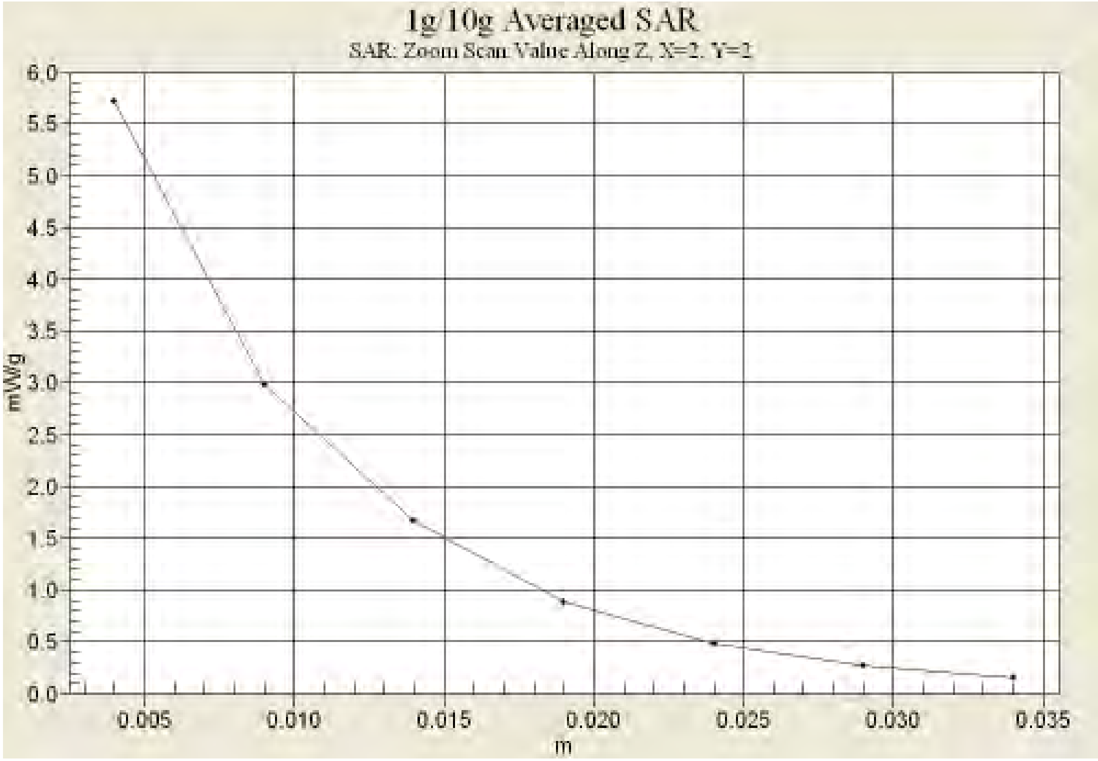
Validation 2450 MHz_Body/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 5.83 mW/g

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



0 dB = 5.72mW/g

Z-Scan


1g/10g Averaged SAR
SAR: Zoom Scan Value Along Z, X=2, Y=2
mW/g
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

5200 ㎒ 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 ℃ Tissue Temp : 22.8℃

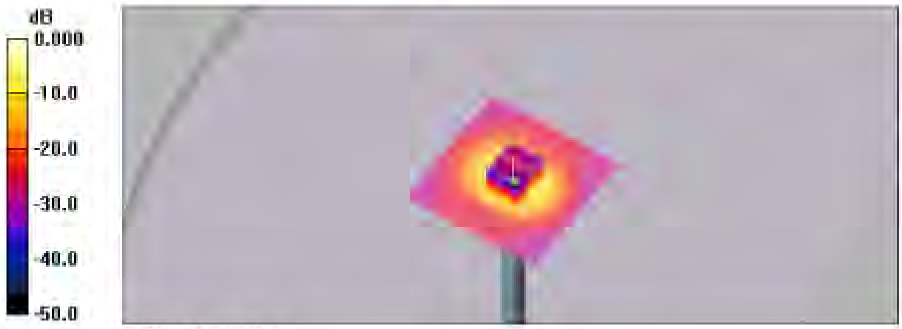
DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: 1130
Program Name: Body Validation

Communication System: CW; Frequency: 5200 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5200 MHz; σ = 5.29 mho/m; ε_r = 48.4; ρ = 1000 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

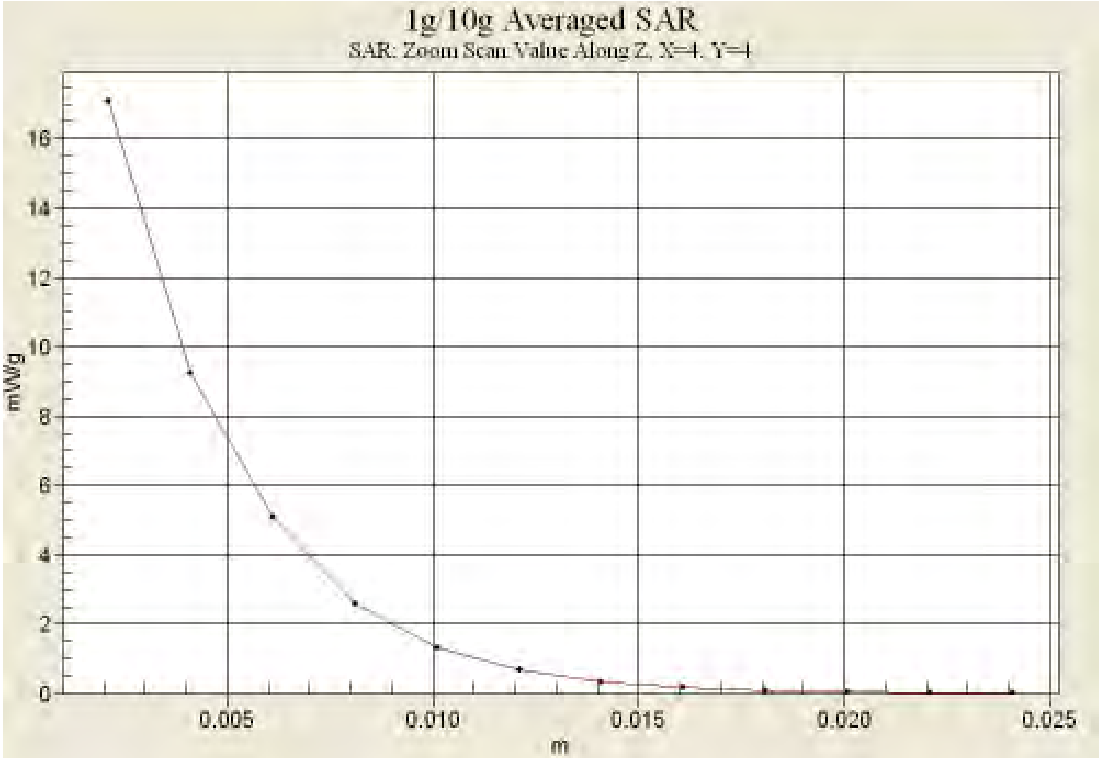
Validation/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 16.8 mW/g

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



0 dB = 17.1mW/g

Z-Scan


1g/10g Averaged SAR
SAR: Zoom Scan Value Along Z, X=4, Y=4
mW/g
16
14
12
10
8
6
4
2
0
0.005
0.010
0.015
0.020
0.025
m

Date: 2012-10-12

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

Input Power : 100 mW

Ambient Temp : 23.7 ℃ Tissue Temp : 22.9℃

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/m^3
Phantom section: Flat Section

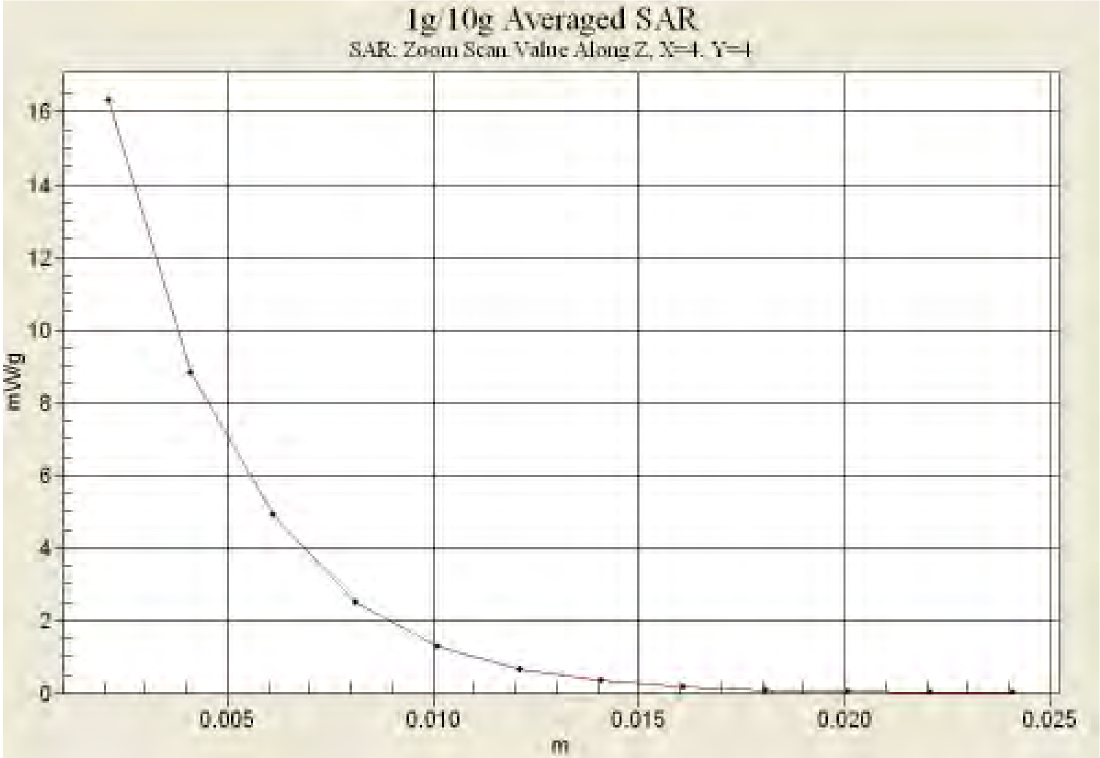
DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(4, 4, 4); Calibrated: 2012-05-23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2012-01-20
- Phantom: ELI 4.0_12_05_30; Type: QDOVA001BA; Serial: 1169
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing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

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

0 dB = 16.3mW/g

Z-Scan


1g/10g Averaged SAR
SAR: Zoom Scan Value Along Z, X=4, Y=4
16
14
12
10
8
6
4
2
0
mW/g
0.005
0.010
0.015
0.020
0.025
m

5500 ㎒ Validation Test_Body

Date: 2012-10-13

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: Validation 5500 MHz_Body.da4

Input Power : 100 mW

Ambient Temp : 23.5 ℃ Tissue Temp : 22.2℃

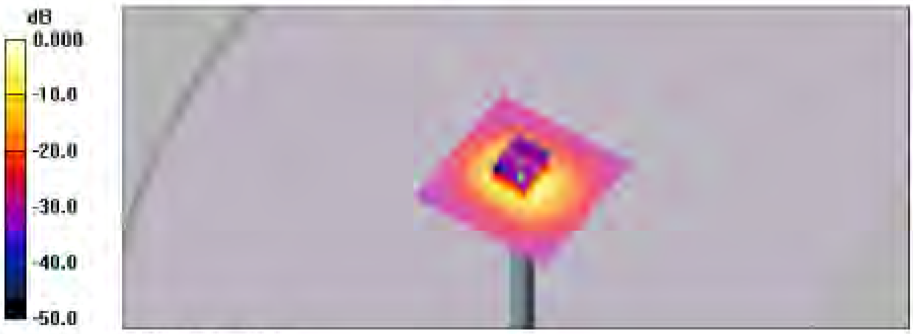
DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: 1130
Program Name: Body Validation

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/m^3
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

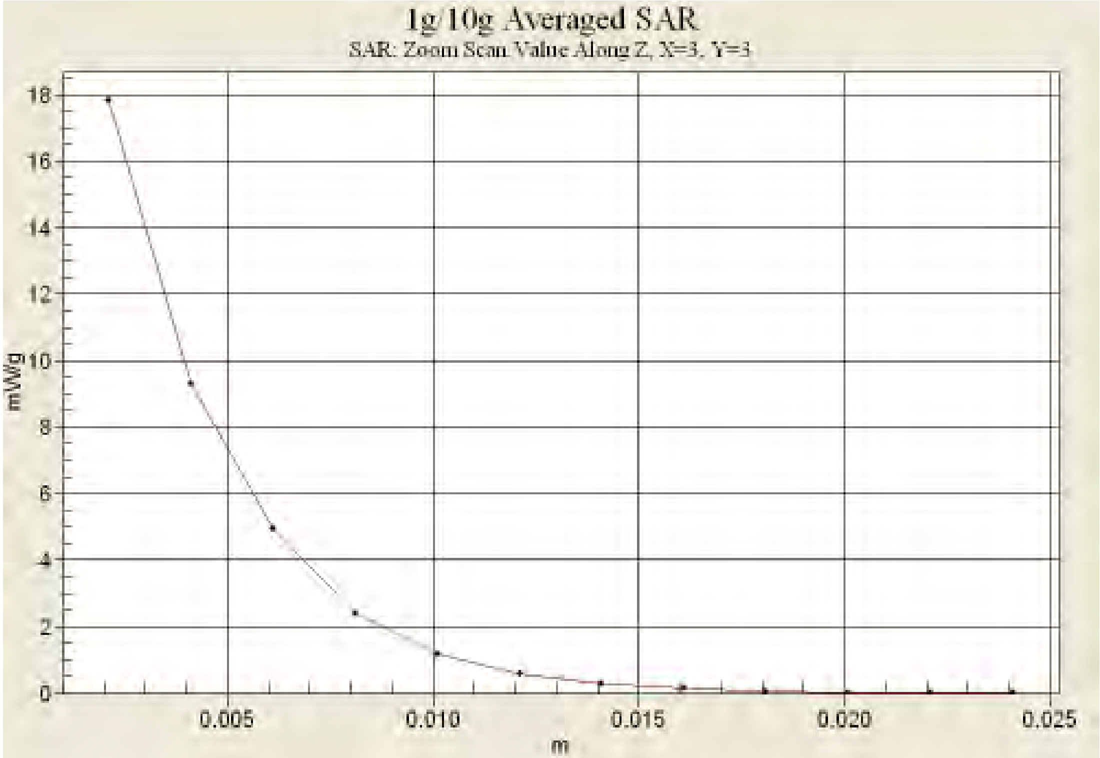
Validation/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 17.3 mW/g

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



0 dB = 17.8mW/g

Z-Scan


1g/10g Averaged SAR
SAR: Zoom Scan Value Along Z, X=3, Y=3
mW/g
18
16
14
12
10
8
6
4
2
0
0.005
0.010
0.015
0.020
0.025
m

5800 ㎒ Validation Test_Body

Date: 2012-10-14

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: Validation 5800 MHz_Body.da4

Input Power : 100 mW

Ambient Temp : 23.8 ℃ Tissue Temp : 22.7℃

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/m^3
Phantom section: Flat Section

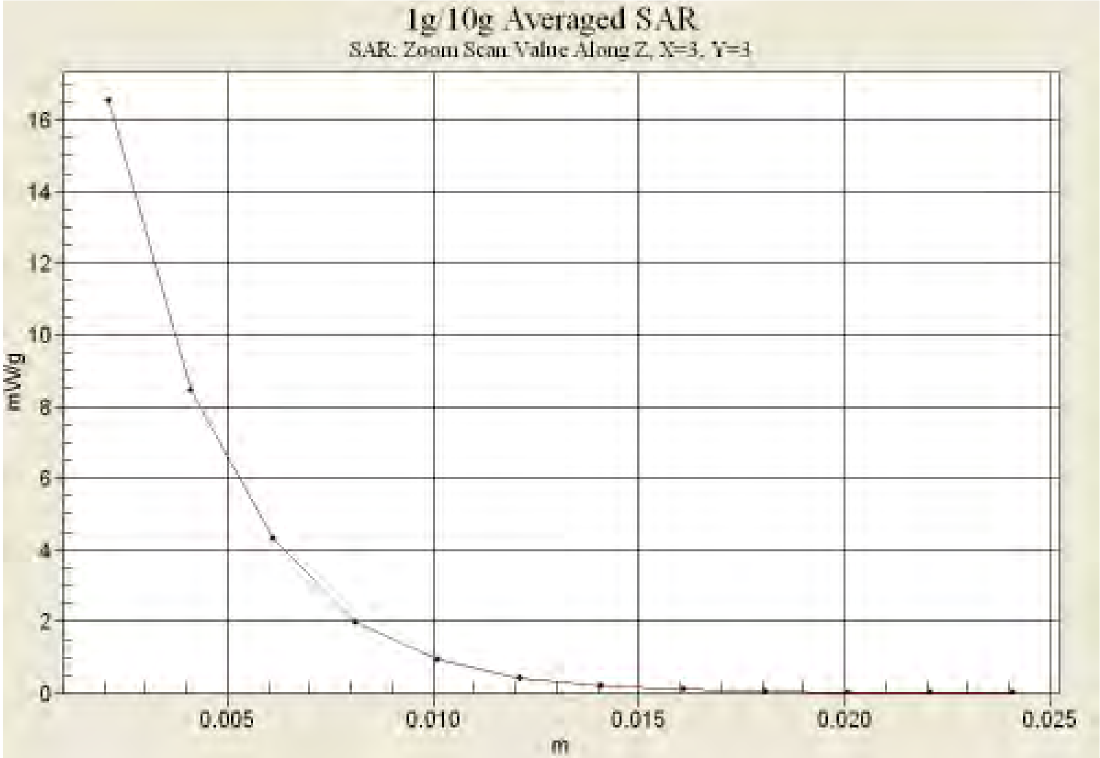
DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.79, 3.79, 3.79); Calibrated: 2012-05-23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn567; Calibrated: 2012-01-20
- Phantom: ELI 4.0_12_05_30; Type: QDOVA001BA; Serial: 1169
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing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

0 dB = 16.5mW/g

Z-Scan


1g/10g Averaged SAR
SAR: Zoom Scan Value Along Z, X=3, Y=3
mW/g
16
14
12
10
8
6
4
2
0
0.005
0.010
0.015
0.020
0.025
m

DCN. CDMA Body SAR

Date: 2012-10-16

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

Ambient Temp : 23.2 ℃ Tissue Temp : 22.0℃

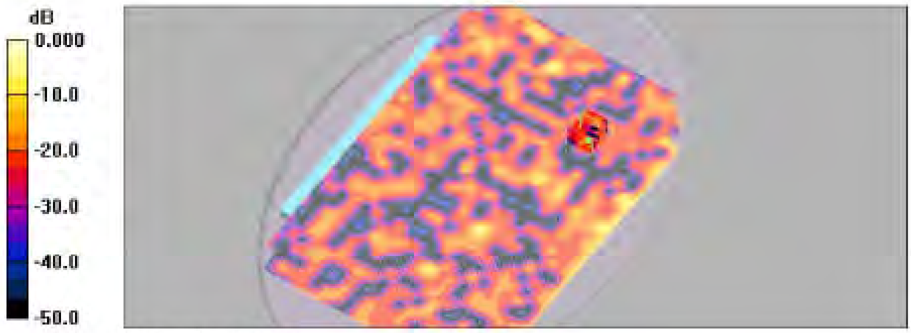
DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E
Program Name: DCN_Body

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/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



0 dB = 0.018mW/g

Date: 2012-10-16

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

Ambient Temp : 23.2 ℃ Tissue Temp : 22.0℃

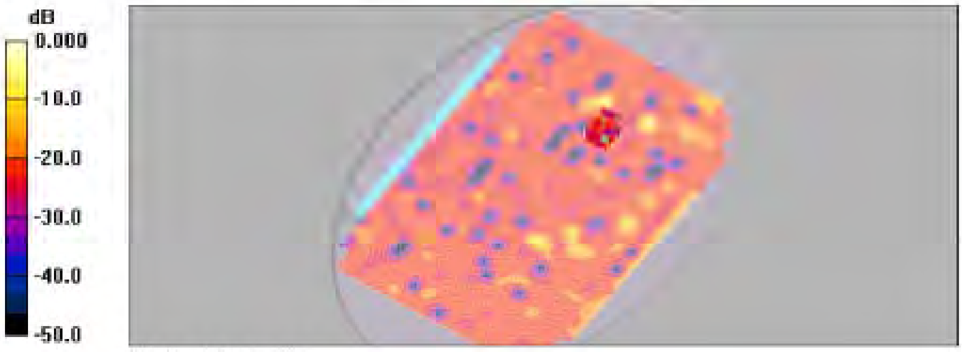
DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E
Program Name: DCN_Body

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/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_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



0 dB = 0.035mW/g

PCS. CDMA Body Test

Date: 2012-10-17

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: PCS_Base_CH600.da4

Ambient Temp : 23.7 ℃ Tissue Temp : 22.9 ℃

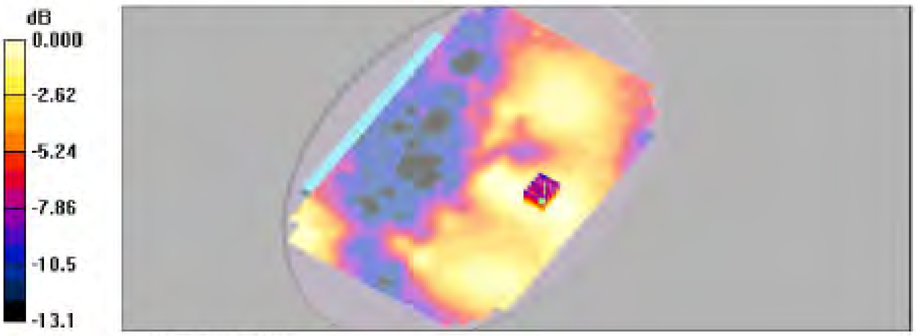
DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E
Program Name: DCN_Body

Communication System: US PCS; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.5 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
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



0 dB = 0.008mW/g

Date: 2012-10-17

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: PCS_Base_Ev-Do_CH600.da4

Ambient Temp : 23.7 ℃ Tissue Temp : 22.9℃

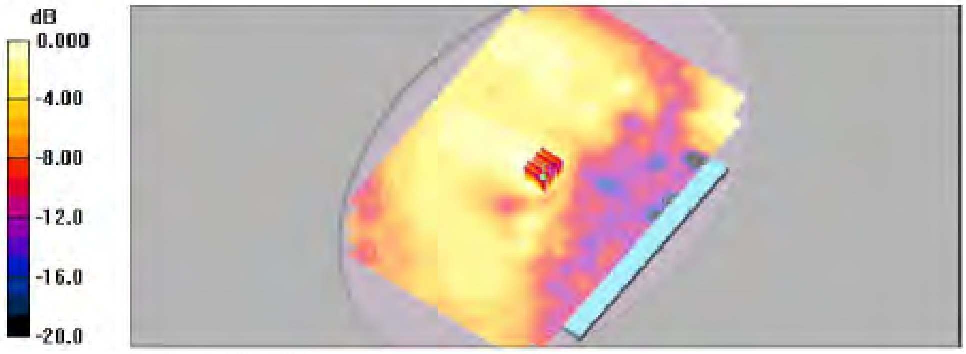
DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E
Program Name: DCN_Body

Communication System: US PCS; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.5 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
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



0 dB = 0.009mW/g

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 ℃ Tissue Temp : 22.2℃

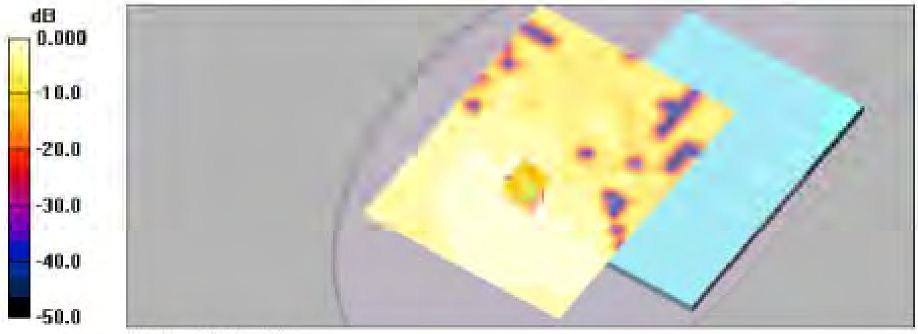
DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E
Program Name: WLAN_Body

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/m^3
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



0 dB = 0.005mW/g

Date: 2012-10-10

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

Ambient Temp : 23.4 ℃ Tissue Temp : 22.2℃

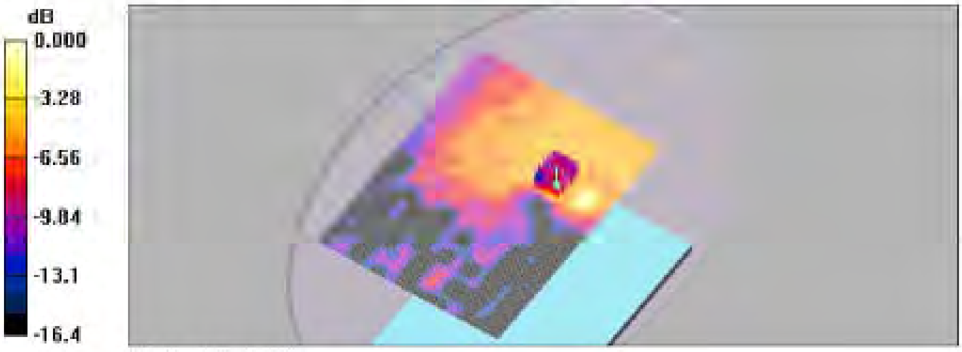
DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E
Program Name: WLAN_Body

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/m^3
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



0 dB = 0.013mW/g

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 ℃ Tissue Temp : 22.8℃

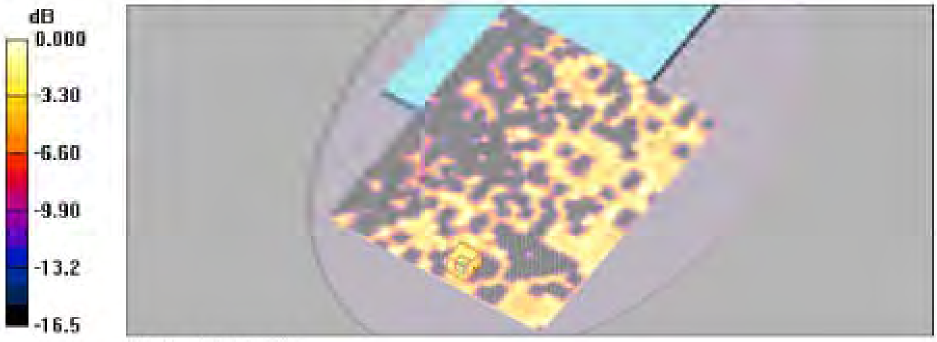
DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E
Program Name: WLAN_Body

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/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

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



0 dB = 0.031mW/g

Date: 2012-10-11

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_Base_11a_6Mbps_CH36_AUX ANT.da4

Ambient Temp : 23.5 ℃ Tissue Temp : 22.8℃

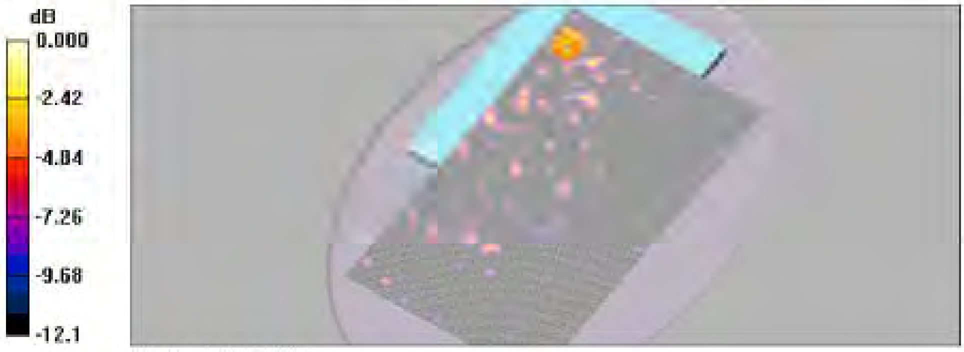
DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E
Program Name: WLAN_Body

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/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

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



0 dB = 0.034mW/g

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 ℃ Tissue Temp : 22.9℃

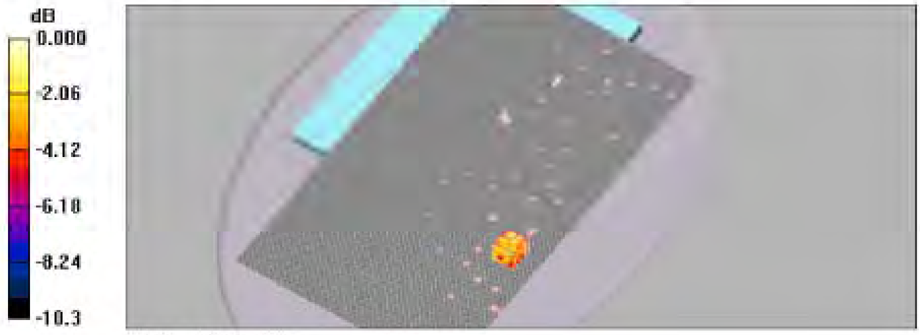
DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E
Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Low); Frequency: 5320 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5320 MHz; σ = 5.53 mho/m; ε_r = 50; ρ = 1000 kg/m^3
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 Drift = 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



0 dB = 0.031mW/g

Date: 2012-10-12

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_Base_11a_6Mbps_CH64_AUX ANT.da4

Ambient Temp : 23.7 ℃ Tissue Temp : 22.9℃

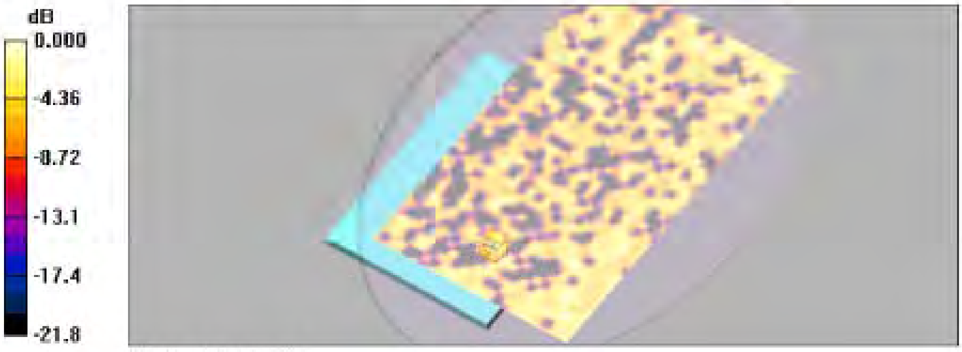
DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E
Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Low); Frequency: 5320 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5320 MHz; σ = 5.53 mho/m; ε_r = 50; ρ = 1000 kg/m^3
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



0 dB = 0.031mW/g

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.da4

Ambient Temp : 23.5 ℃ Tissue Temp : 22.2℃

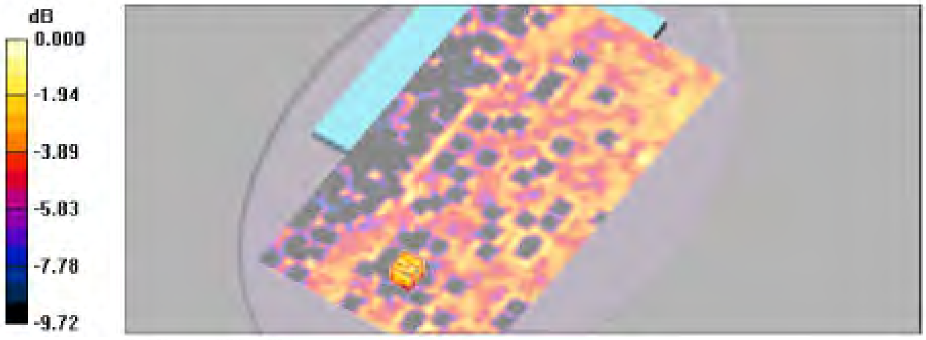
DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E
Program Name: WLAN_Body

Communication System: WLAN(11a_H or CEPT); Frequency: 5700 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5700 MHz; σ = 5.76 mho/m; ε_r = 48; ρ = 1000 kg/m^3
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



0 dB = 0.037mW/g

Date: 2012-10-13

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_Base_11a_6Mbps_CH140_AUX ANT.da4

Ambient Temp : 23.5 ℃ Tissue Temp : 22.2℃

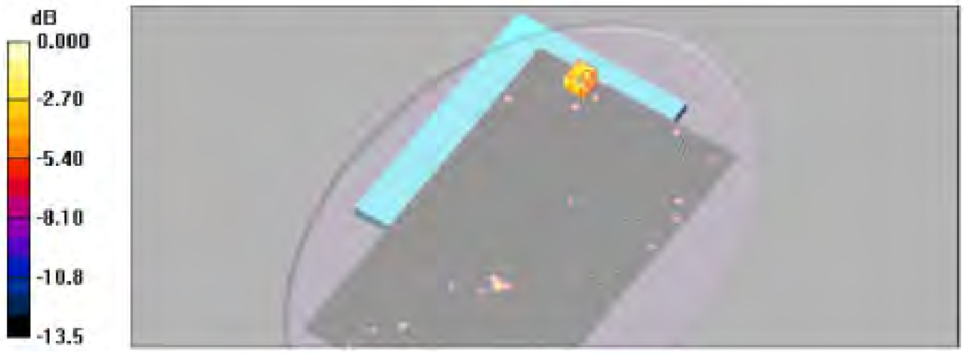
DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E
Program Name: WLAN_Body

Communication System: WLAN(11a_H or CEPT); Frequency: 5700 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5700 MHz; σ = 5.76 mho/m; ε_r = 48; ρ = 1000 kg/m^3
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



0 dB = 0.031mW/g

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 ℃ Tissue Temp : 22.7℃

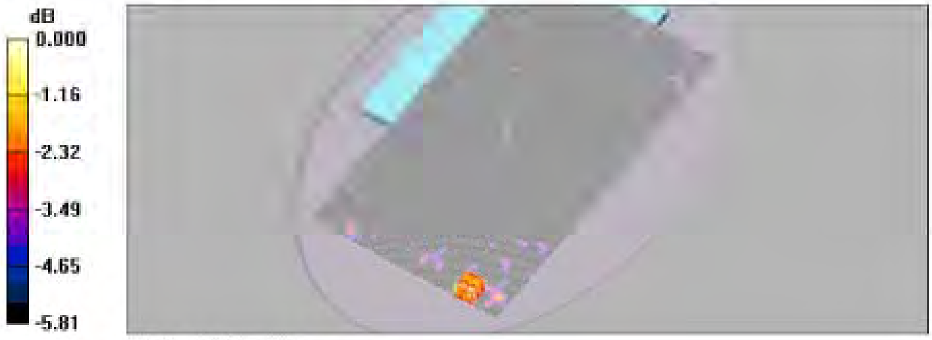
DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E
Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Upper); Frequency: 5825 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5825 MHz; $\sigma = 5.96$ mho/m; $\varepsilon_r = 47.7$; $\rho = 1000$ kg/m^3
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, dy=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



0 dB = 0.045mW/g

Date: 2012-10-14

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

Ambient Temp : 23.8 ℃ Tissue Temp : 22.7℃

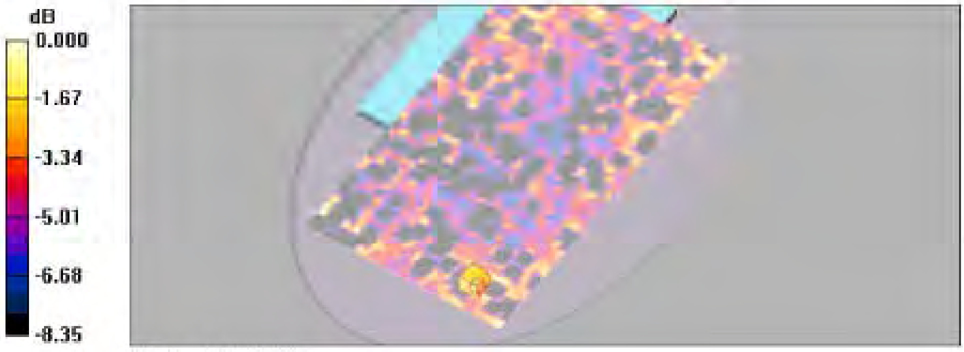
DUT: XE303C12; Type: Notebook; Serial: HWG591WC700015E
Program Name: WLAN_Body

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/m^3
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



0 dB = 0.039mW/g

Uncertainty Analysis (2.45GHz)

a	b	c	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

Uncertainty Analysis (5GHz)

a	b	c	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	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	2.68	N	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	N	1	0.6	0.34
Combined standard uncertainty				RSS		11.14
Expanded uncertainty (95% CONFIDENCE INTERVAL)				K=2		22.28

Appendix C

Calibration Certificate

- PROBE (ET3DV6, EX3DV4)

- DAE 3

-835 ㎒ / 1900 ㎒ / 2450 ㎒ / 5 ㎓ DIPOLE

- PROBE Calibration Certificate (ET3DV6)

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

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

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

Accreditation No.: **SCS 108**

Client **SGS (Dymstec)**

Certificate No: **ET3-1782_Apr12**

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN:1782
Calibration procedure(s)	QA CAL-01.v8, QA CAL-12.v7, QA CAL-23.v4, QA CAL-25.v4 Calibration procedure for dosimetric E-field probes
Calibration date:	April 27, 2012

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 660	10-Jan-12 (No. DAE4-660_Jan12)	Jan-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 27, 2012

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

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S Servizio svizzero di taratura
Swiss Calibration Service

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

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z, 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.

Probe ET3DV6

SN:1782

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

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

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	2.01	1.66	1.88	± 10.1 %
DCP (mV)[B]	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%.

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

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
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.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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

Calibration Parameter Determined in Body Tissue Simulating Media

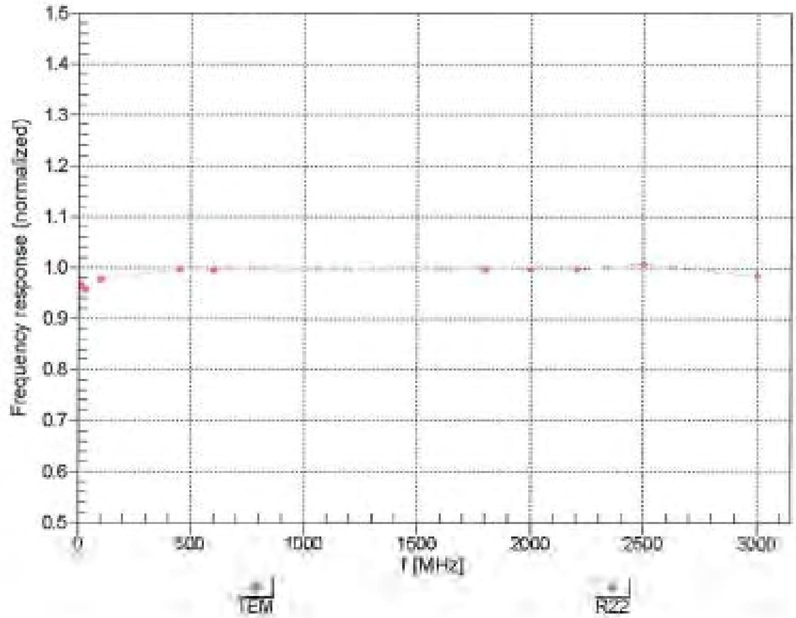
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	7.57	7.57	7.57	0.16	2.29	± 13.4 %
835	55.2	0.97	6.22	6.22	6.22	0.24	3.00	± 12.0 %
1750	53.4	1.49	4.79	4.79	4.79	0.76	2.24	± 12.0 %
1900	53.3	1.52	4.59	4.59	4.59	0.75	2.18	± 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.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

ET3DV6– SN:1782 April 27, 2012

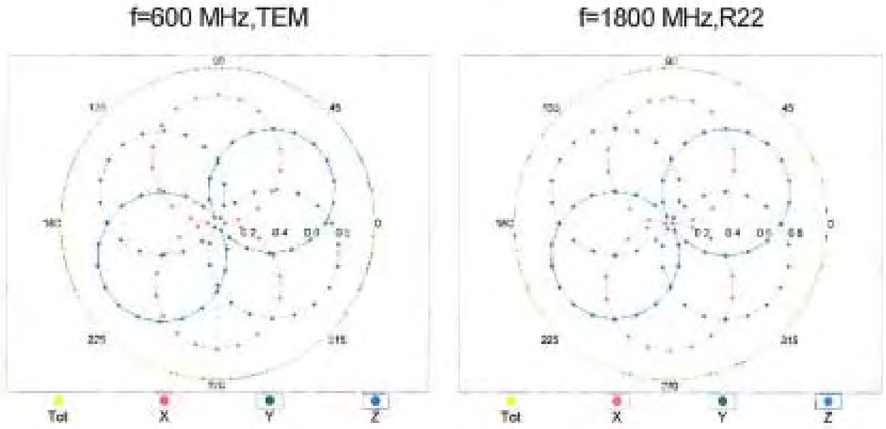
Frequency Response of E-Field

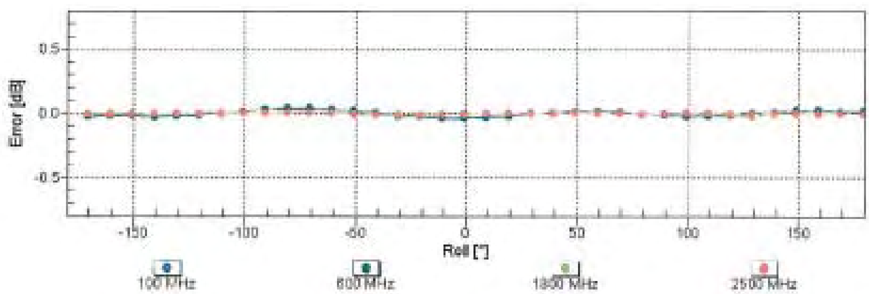
(TEM-Cell:ifi110 EXX, Waveguide: R22)



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

Receiving Pattern (ϕ), ϑ = 0°

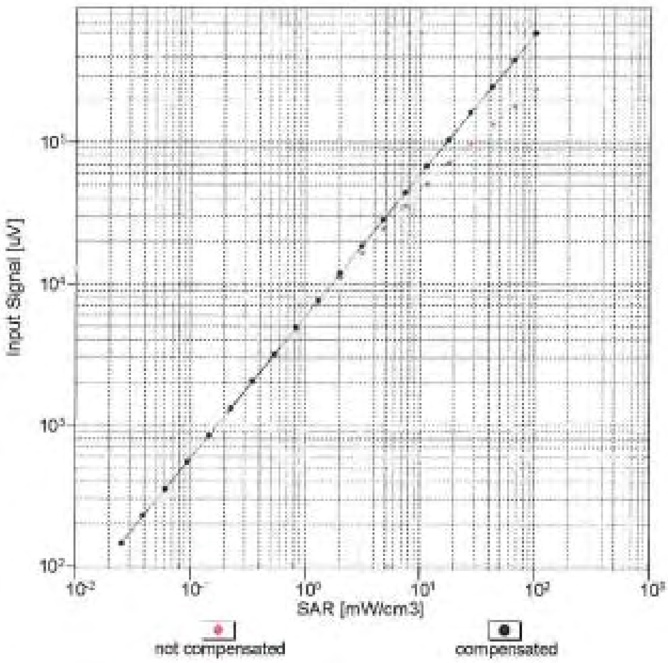


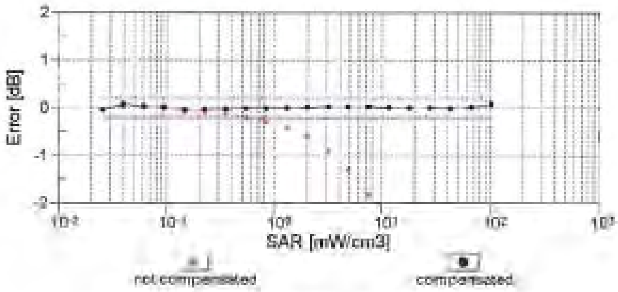


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

ET3DV6– SN:1782 April 27, 2012

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

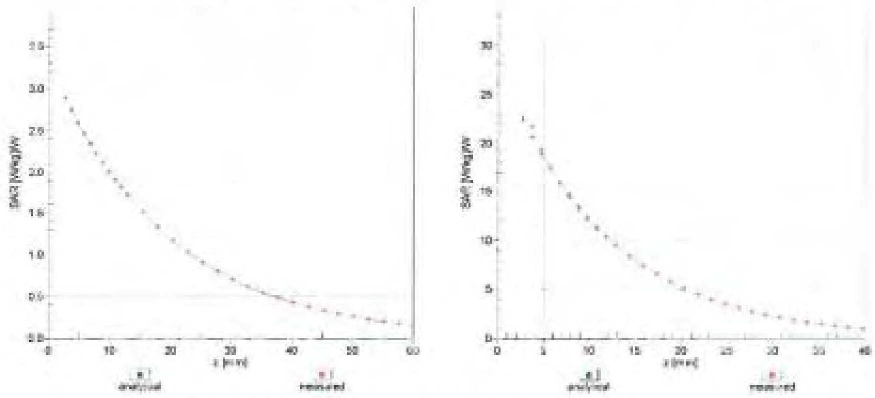




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

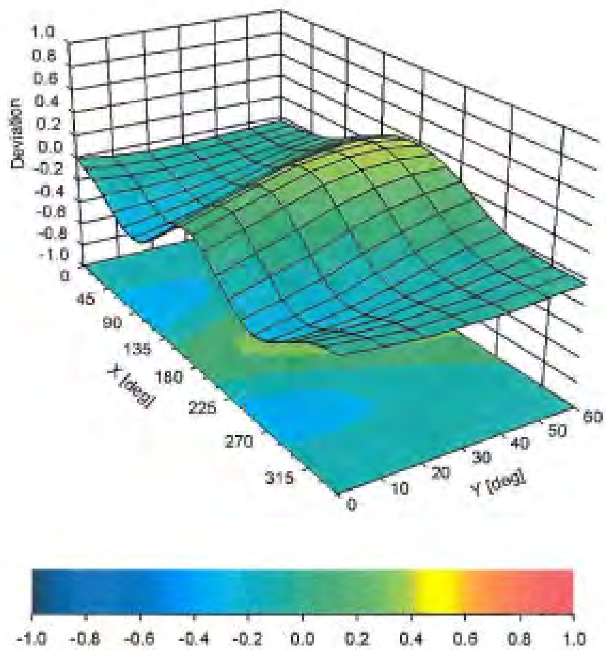
ET3DV6– SN:1782 April 27, 2012

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

DASY/EASY - Parameters of Probe: 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

- PROBE Calibration Certificate (EX3DV4)

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

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Accreditation No.: **SCS 108**

Client **SGS (Dymstec)**

Certificate No: **EX3-3791_May12**

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3791
Calibration procedure(s)	QA CAL-01.v8, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4 Calibration procedure for dosimetric E-field probes
Calibration date:	May 23, 2012

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 660	10-Jan-12 (No. DAE4-660_Jan12)	Jan-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

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

Issued: May 24, 2012

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

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

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Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z, 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.

Probe EX3DV4

SN:3791

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

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

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.51	0.56	0.55	± 10.1 %
DCP (mV)[B]	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%.

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

EX3DV4– SN:3791 May 23, 2012

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
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 %

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

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

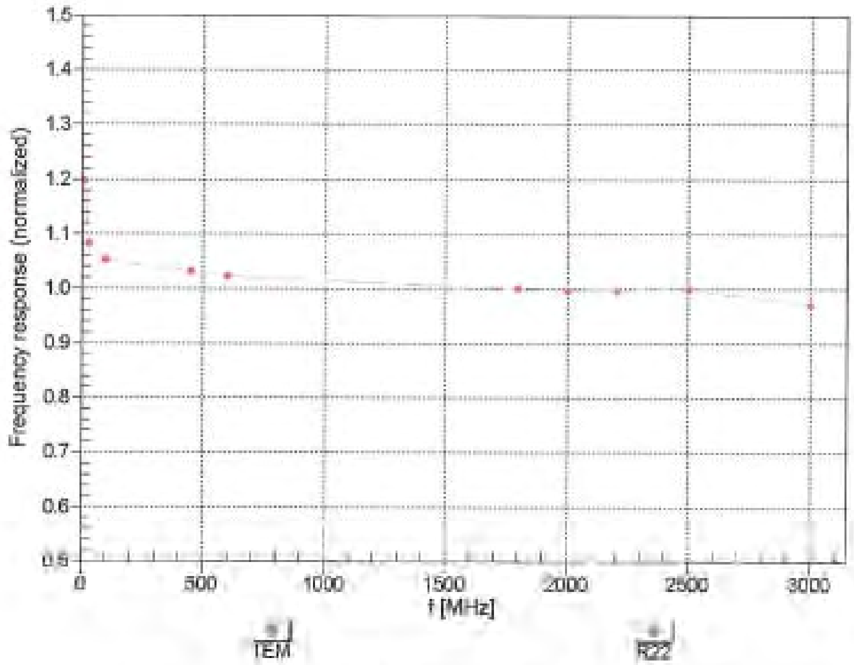
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
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 %

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

Frequency Response of E-Field

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

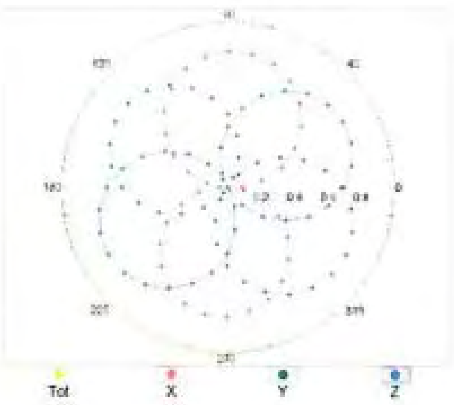


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

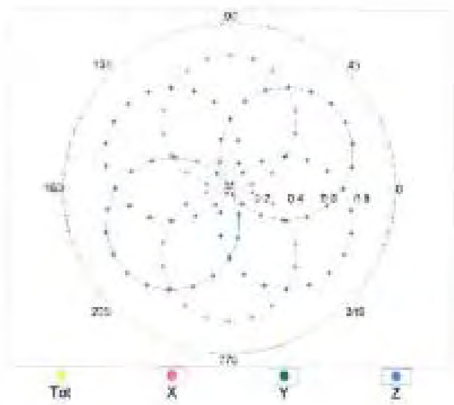
EX3DV4– SN:3791 May 23, 2012

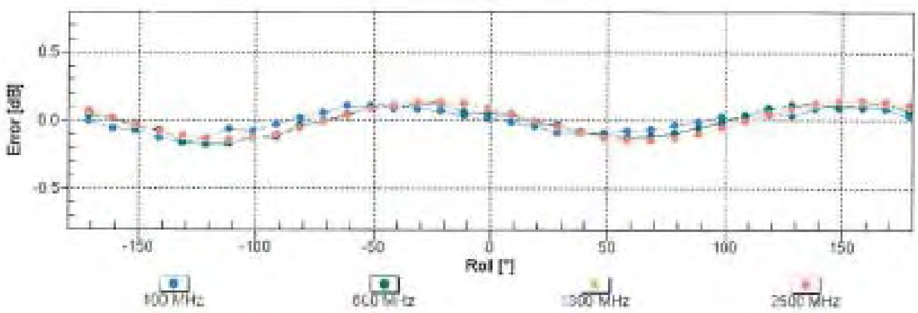
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22

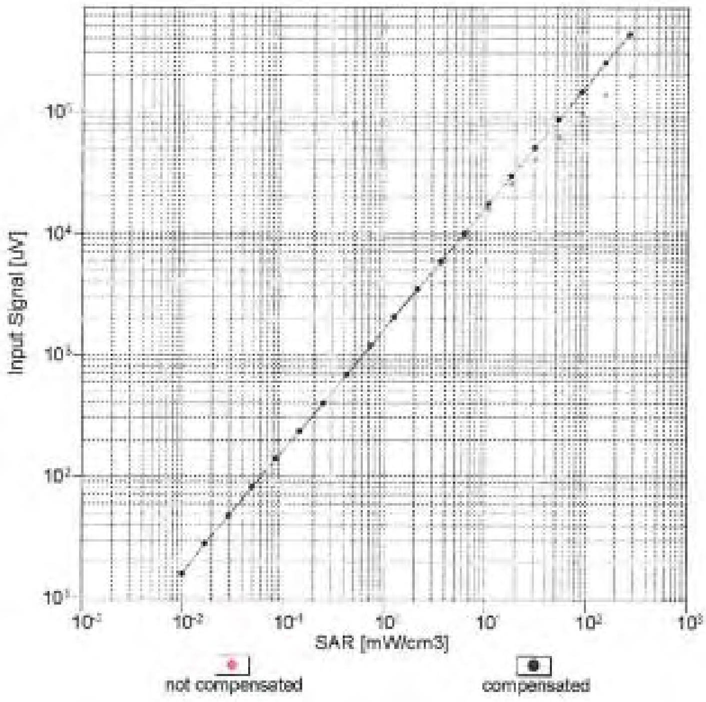


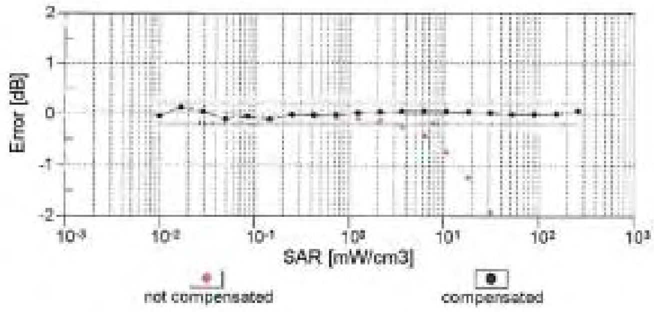


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR$_{head}$)

(TEM cell , f = 900 MHz)



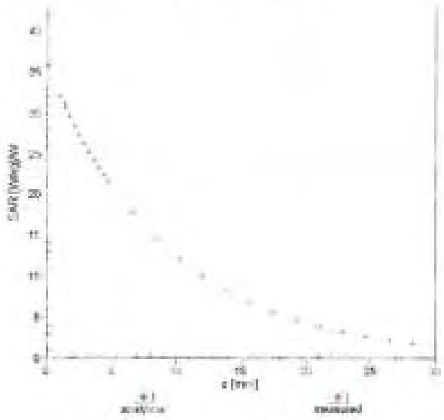


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

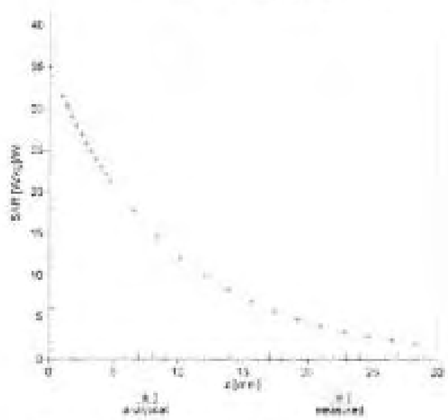
EX3DV4– SN:3791 May 23, 2012

Conversion Factor Assessment

f = 2600 MHz,WGLS R22 (H_convF)

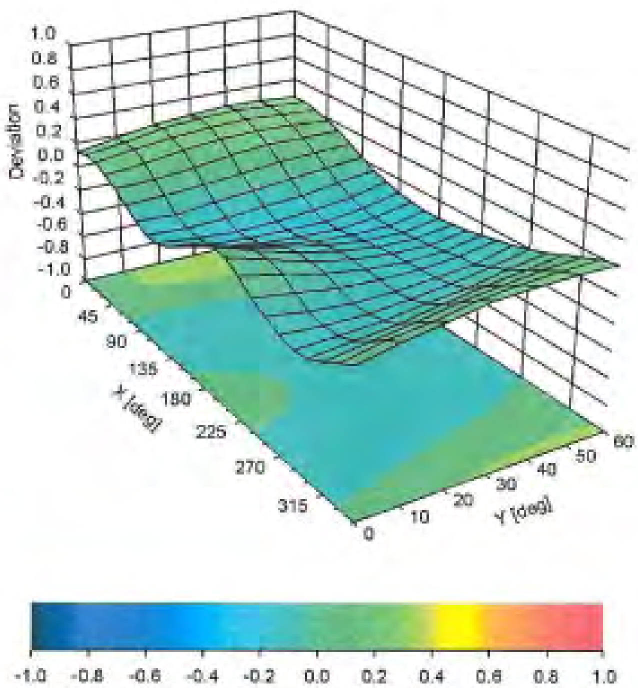


f = 2600 MHz,WGLS R22 (M_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

DASY/EASY - Parameters of Probe: 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

-DAE 3 Calibration Certificate

Calibration Laboratory of
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Accreditation No.: SCS 108

Client **SGS (Dymstec)**

Certificate No: **DAE3-567_Jan12**

CALIBRATION CERTIFICATE

Object	DAE3 - SD 000 D03 AA - SN: 567
Calibration procedure(s)	QA CAL-06.v24 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	January 20, 2012

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	28-Sep-11 (No: 11450)	Sep-12
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Calibrator Box V2.1	SE UWS 053 AA 1001	05-Jan-12 (in house check)	In house check: Jan-13

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

Issued: January 20, 2012

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Certificate No: DAE3-567_Jan12 Page 1 of 5

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Accreditation No.: SCS 108

Glossary

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

Methods Applied and Interpretation of Parameters

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

DC Voltage Measurement

A/D - Converter Resolution nominal

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

Low Range: 1LSB = 61nV , full range = -1.......+3mV

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

Calibration Factors	X	Y	Z
High Range	404.763 ± 0.1% (k=2)	404.411 ± 0.1% (k=2)	408.899 ± 0.1% (k=2)
Low Range	3.95035 ± 0.7% (k=2)	3.97119 ± 0.7% (k=2)	3.95014 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	7.5° ± 1°

Appendix

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	199998.62	3.53	0.00
Channel X	+ Input	20005.03	4.17	0.02
Channel X	- Input	-19996.67	3.44	-0.02
Channel Y	+ Input	199997.37	2.30	0.00
Channel Y	+ Input	19999.48	-1.11	-0.01
Channel Y	- Input	-19998.08	1.52	-0.01
Channel Z	+ Input	199994.27	-0.65	-0.00
Channel Z	+ Input	20001.19	0.52	0.00
Channel Z	- Input	-19995.78	4.48	-0.02

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	1998.73	-1.35	-0.07
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	-198.26	-0.95	0.48

2. Common mode sensitivity

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

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	6.01	1.84
	- 200	-13.55	-1.50
Channel Y	200	-1.13	-2.59
	- 200	1.36	1.24
Channel Z	200	4.36	4.11
	- 200	-5.62	-6.33

3. Channel separation

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

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	-2.44	-2.08
Channel Y	200	7.42	-	-1.61
Channel Z	200	5.84	8.06	-

Certificate No: DAE3-567_Jan12 Page 4 of 5

4. AD-Converter Values with inputs shorted

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

	High Range (LSB)	Low Range (LSB)
Channel X	16326	15742
Channel Y	16161	15582
Channel Z	15963	16228

5. Input Offset Measurement

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

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.24	-1.71	1.46	0.53
Channel Y	-0.13	-2.46	1.09	0.49
Channel Z	-0.85	-3.00	0.31	0.42

6. Input Offset Current

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

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

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

9. Power Consumption (Typical values for information)

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

- 835 ㎒ Dipole Calibration Certificate

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Accreditation No.: **SCS 108**

Client **SGS (Dymstec)**

Certificate No: **D835V2-490_May12**

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 490
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	May 16, 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 ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

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

Issued: May 16, 2012

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Certificate No: D835V2-490_May12 Page 1 of 8

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Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.1
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^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.58 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**6.19 mW / g ± 16.5 % (k=2)**

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

DASY5 Validation Report for Head TSL

Date: 16.05.2012

Test Laboratory: SPEAG, Zurich, Switzerland

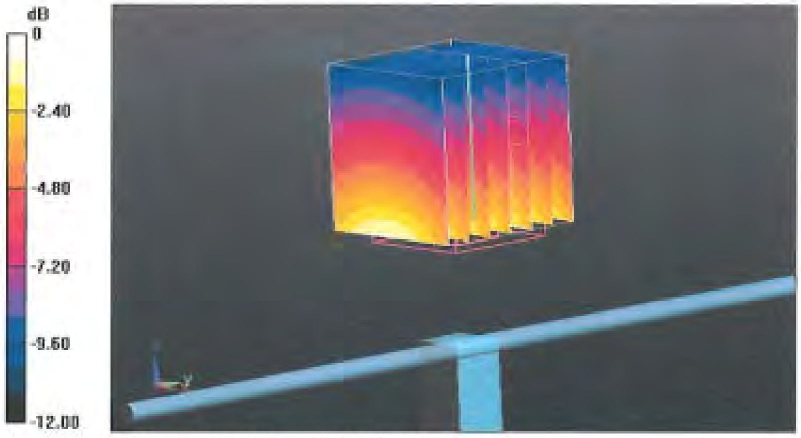
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 490

Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.89 mho/m; ε_r = 40.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

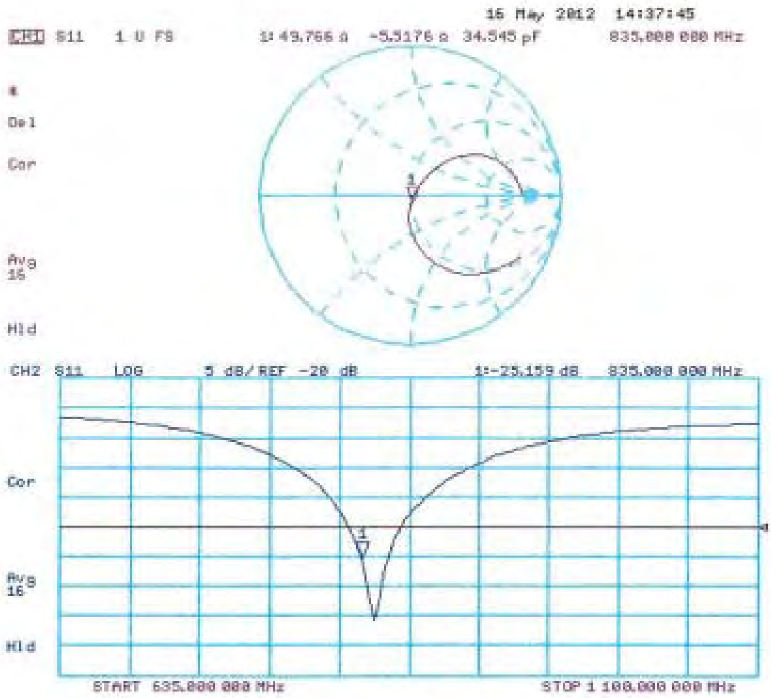
- Probe: ES3DV3 - SN3205; ConvF(6.07, 6.07, 6.07); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

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

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 16.05.2012

Test Laboratory: SPEAG, Zurich, Switzerland

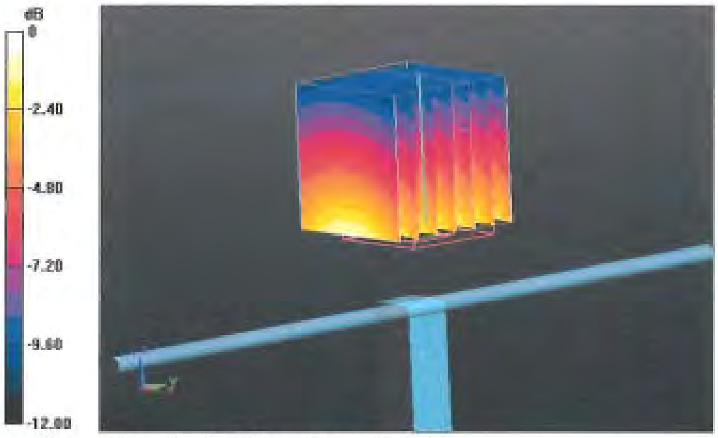
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 490

Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 1 mho/m; ε_r = 54.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

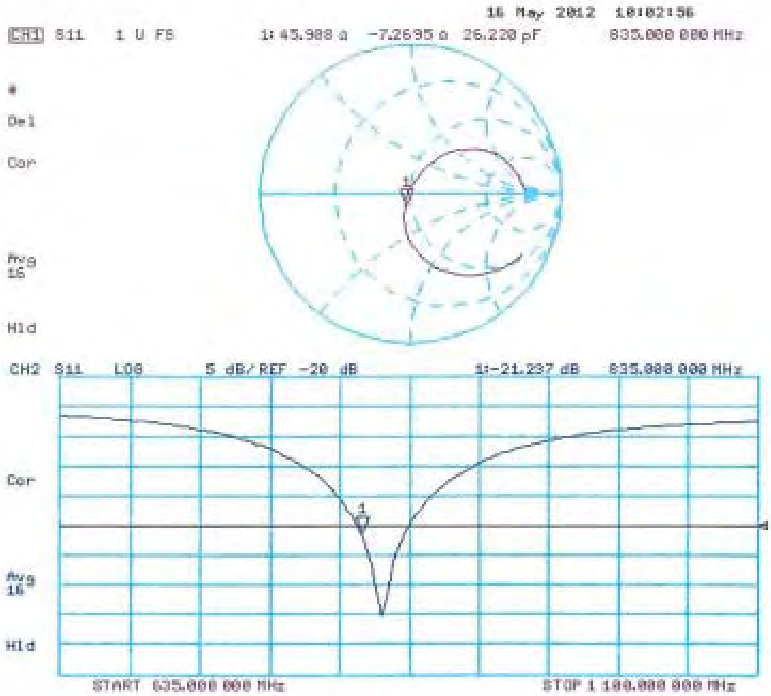
- Probe: ES3DV3 - SN3205; ConvF(6.02, 6.02, 6.02); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

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

Impedance Measurement Plot for Body TSL



- 1900 ㎒ Dipole Calibration Certificate

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Accreditation No.: **SCS 108**

Client **SGS (Dymstec)**

Certificate No: **D1900V2-5d033_May12**

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d033
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	May 23, 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 ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

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

Issued: May 23, 2012

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Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.1
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 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	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 measured	250 mW input power	5.13 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**20.7 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	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 measured	250 mW input power	5.31 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.2 mW / g ± 16.5 % (k=2)**

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

DASY5 Validation Report for Head TSL

Date: 23.05.2012

Test Laboratory: SPEAG, Zurich, Switzerland

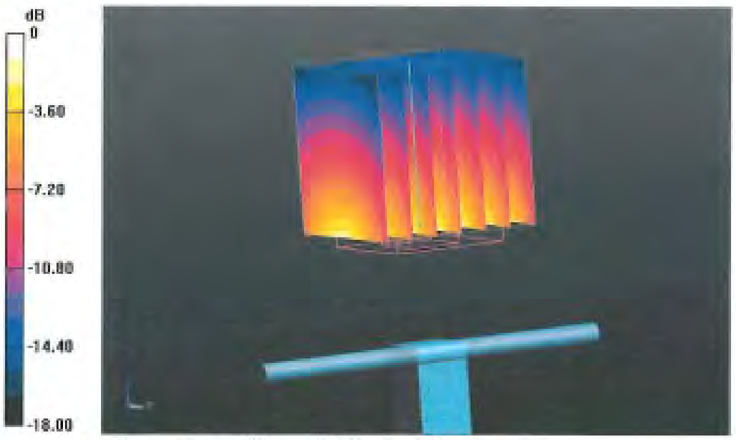
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d033

Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.37 mho/m; ε_r = 40.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

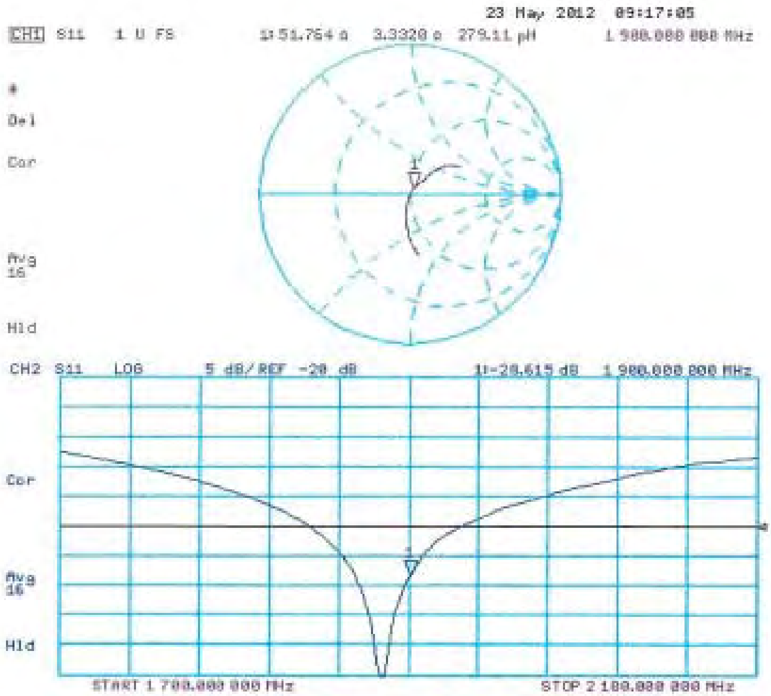
- Probe: ES3DV3 - SN3205; ConvF(5.01, 5.01, 5.01); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Head Tissue/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

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 23.05.2012

Test Laboratory: SPEAG, Zurich, Switzerland

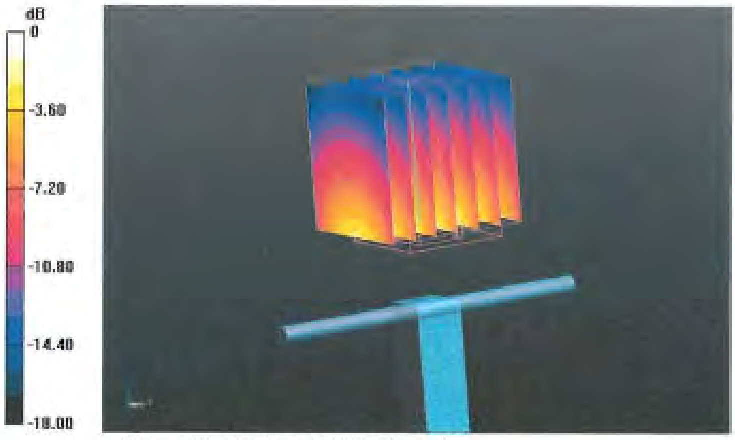
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d033

Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.52 mho/m; ε_r = 52.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

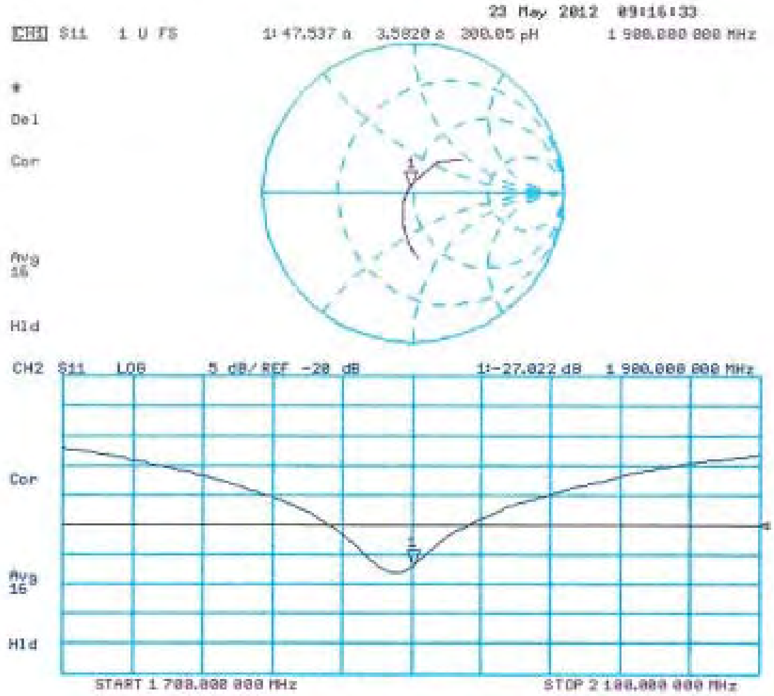
- Probe: ES3DV3 - SN3205; ConvF(4.62, 4.62, 4.62); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

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 = 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

Impedance Measurement Plot for Body TSL



Certificate No: D1900V2-5d033_May12 Page 8 of 8

- 2450 ㎒ Dipole Calibration Certificate

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Accreditation No.: SCS 108

Client **SGS (Dymstec)**

Certificate No: **D2450V2-734_May12**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 734
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	May 17, 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 ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 54206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

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

Issued: May 17, 2012

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Certificate No: D2450V2-734_May12 Page 1 of 8

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.1
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^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.19 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**24.7 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	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 measured	250 mW input power	5.95 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**23.6 mW / g ± 16.5 % (k=2)**

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

DASY5 Validation Report for Head TSL

Date: 17.05.2012

Test Laboratory: SPEAG, Zurich, Switzerland

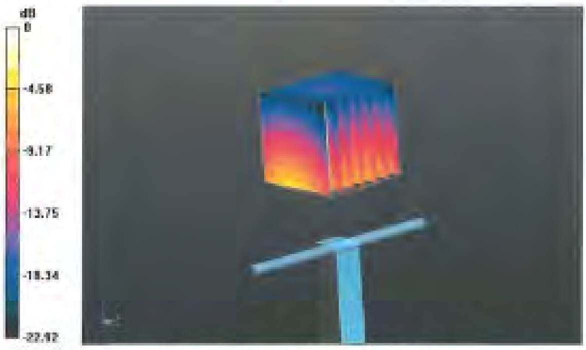
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 734

Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.85 mho/m; ε_r = 40.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

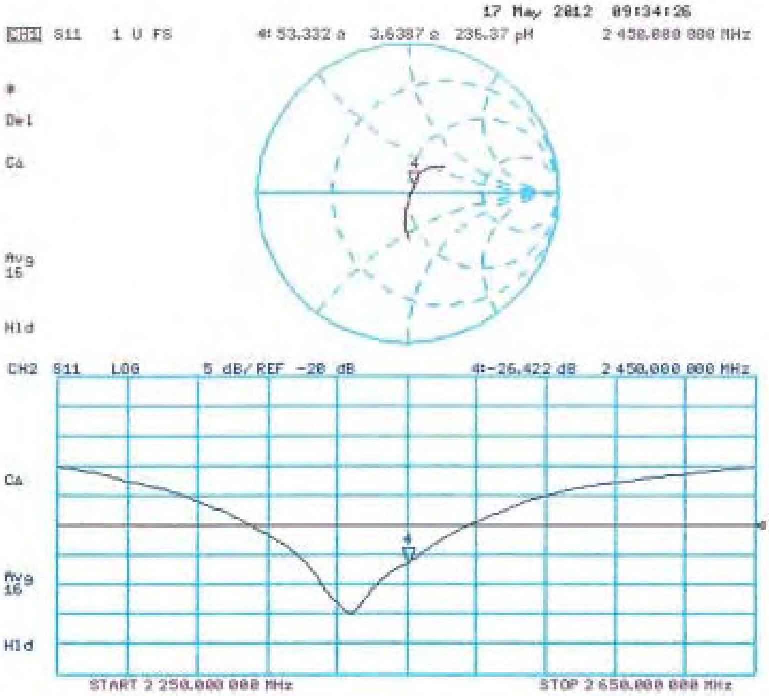
- Probe: ES3DV3 - SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Head 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

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 15.05.2012

Test Laboratory: SPEAG, Zurich, Switzerland

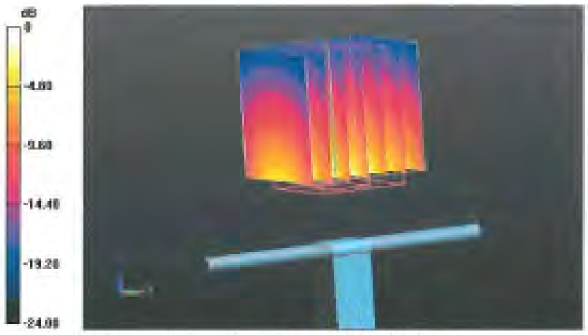
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 734

Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.99 mho/m; ε_r = 52.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

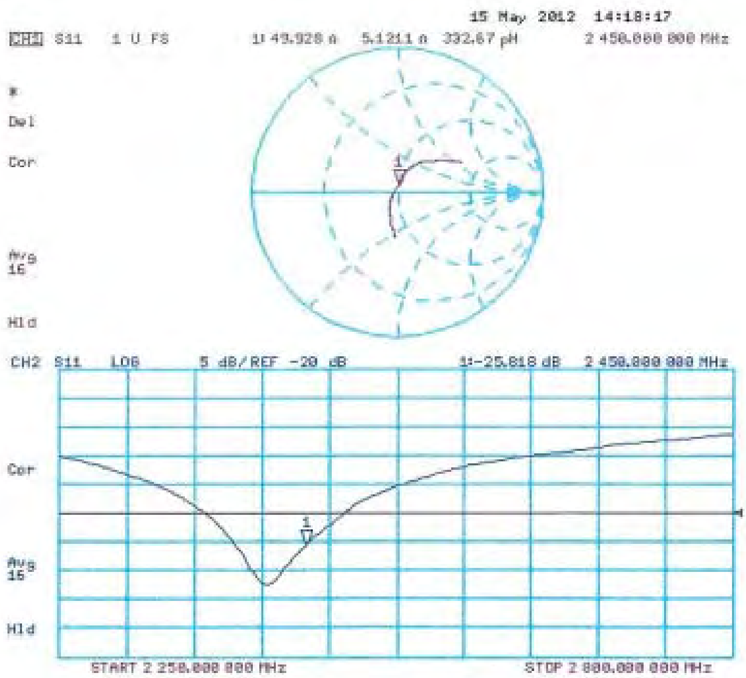
- Probe: ES3DV3 - SN3205; ConvF(4.26, 4.26, 4.26); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

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 Drift = 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

Impedance Measurement Plot for Body TSL



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

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Accreditation No.: **SCS 108**

Client **SGS (Dymstec)**

Certificate No: **D5GHzV2-1130_Jul12**

CALIBRATION CERTIFICATE

Object	D5GHzV2 - SN: 1130
Calibration procedure(s)	QA CAL-22.v1 Calibration procedure for dipole validation kits between 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:	Israe El-Naouq	Laboratory Technician	Israe El-Naouq
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 3, 2012

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Certificate No: D5GHzV2-1130_Jul12 Page 1 of 13

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Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

a) 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%.

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)
Frequency	5200 MHz ± 1 MHz 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 mho/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 measured	100 mW input power	2.37 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**23.6 mW /g ± 19.5 % (k=2)**

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 measured	100 mW input power	2.48 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**24.7 mW / g ± 19.5 % (k=2)**

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 measured	100 mW input power	2.33 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**23.2 mW / g ± 19.5 % (k=2)**

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^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.11 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**20.9 mW / g ± 19.5 % (k=2)**

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 mho/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)**

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 measured	100 mW input power	2.08 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**20.6 mW / g ± 19.5 % (k=2)**

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 jΩ
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

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/m^3 , Medium parameters used: f = 5500 MHz; σ = 4.82 mho/m; ε_r = 35.2; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 5.14 mho/m; ε_r = 34.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

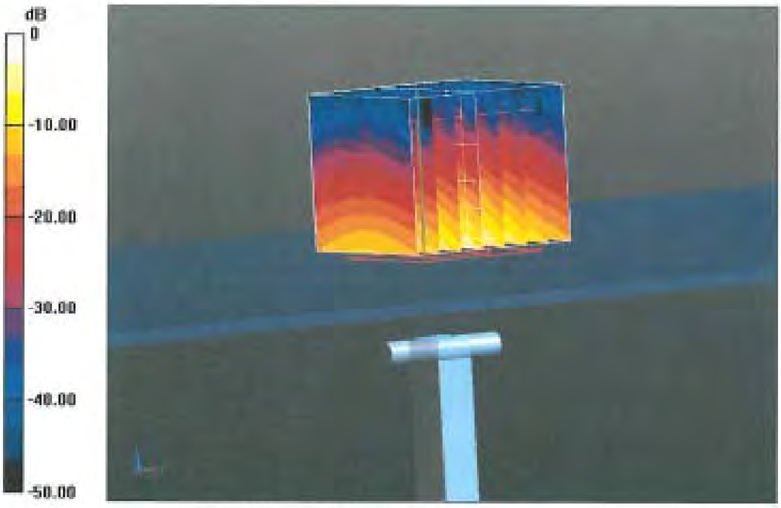
DASY52 Configuration:

- 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

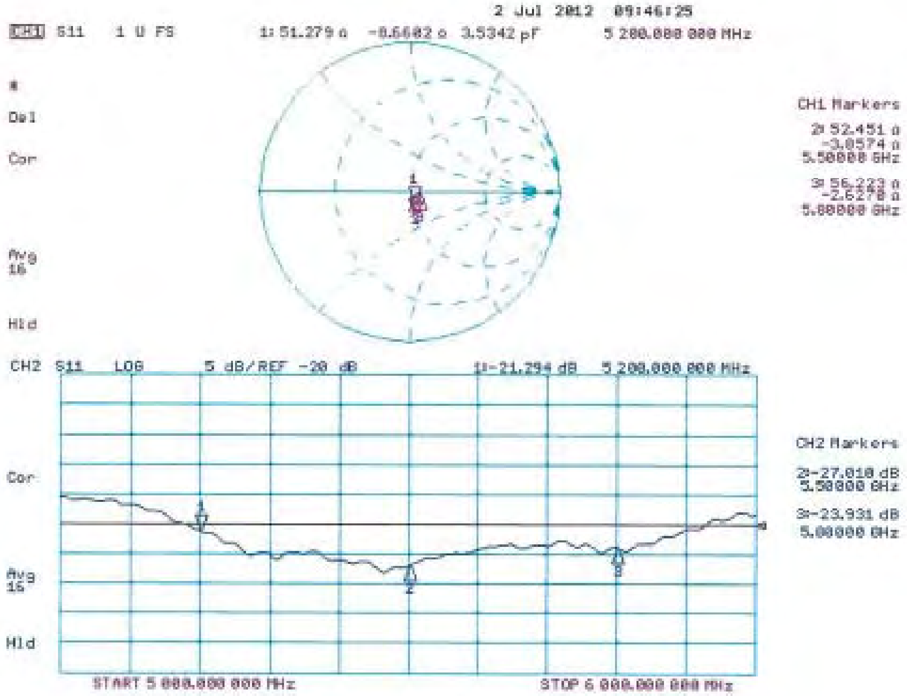
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.390 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 34.226 mW/g
SAR(1 g) = 8.68 mW/g; SAR(10 g) = 2.48 mW/g
Maximum value of SAR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



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

Impedance Measurement Plot for Head TSL



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/m^3 , Medium parameters used: f = 5500 MHz; σ = 5.76 mho/m; ε_r = 46.5; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 6.16 mho/m; ε_r = 46; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

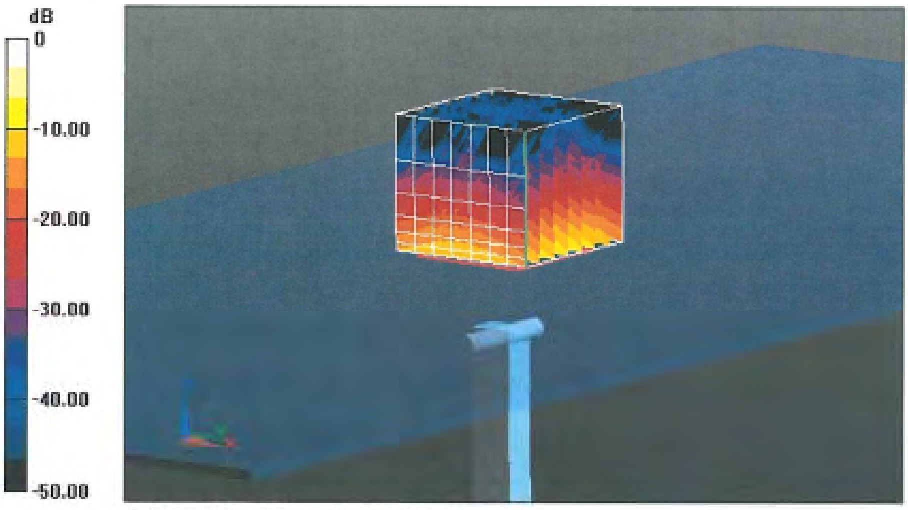
DASY52 Configuration:

- 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

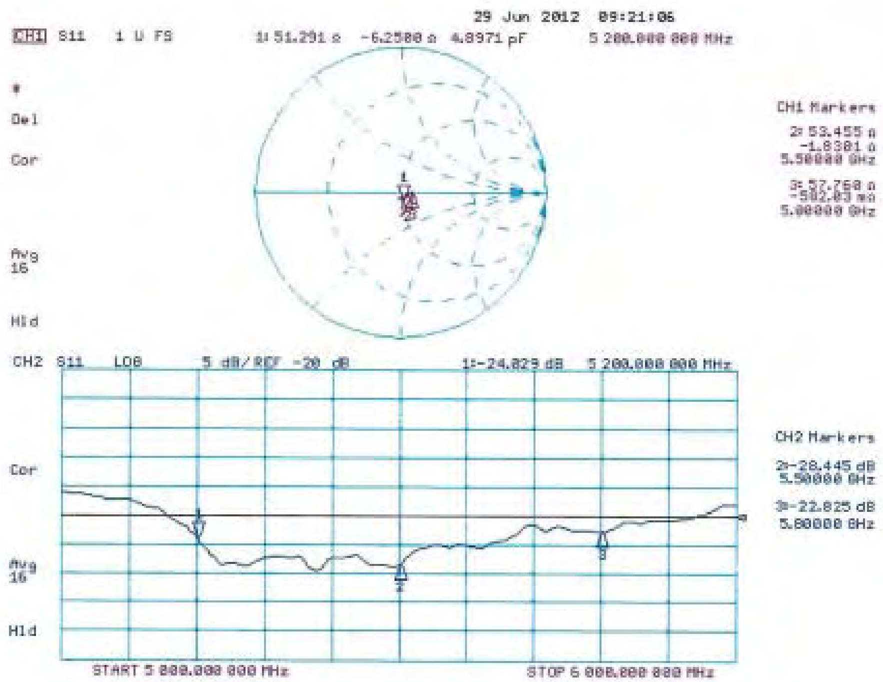
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.679 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 34.309 mW/g
SAR(1 g) = 7.94 mW/g; SAR(10 g) = 2.2 mW/g
Maximum value of SAR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



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

Impedance Measurement Plot for Body TSL



-THE END-