

SAR TEST REPORT

Equipment Under Test	: Digital Camera
Model No.	: NX300
Applicant	: Samsung Electronics Co., Ltd.
Address of Applicant	: 129, Samsung-ro, Yeongtong-gu, Suwon-city, Gyeonggi-do, 443-742 Korea, Republic of
FCC ID	: A3LNX300
IC ID	: 649E-NX300
Device Category	: Portable Device
Exposure Category	: General Population/Uncontrolled Exposure
Date of Receipt	: 2013-01-14
Date of Test(s)	: 2013-01-23 ~ 2013-01-25
Date of Issue	: 2013-01-31



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	: Jongwon Ma		2013-01-31
Approved by	: Denny Ham		2013-01-31

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APPENDIX

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1. General Information

1.1 Testing Laboratory

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1.2 Details of Manufacturer

Manufacturer : Samsung Electronics Co., Ltd.
 Address : 129, Samsung-ro, Yeongtong-gu, Suwon-city, Gyeonggi-do, 443-742 Korea, Republic of
 Contact Person : Jeongjo-Hwang
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1.3 Version of Report

Version Number	Date	Revision
00	2013-01-31	Initial issue

1.4 Description of EUT(s)

EUT Type	: Digital Camera		
Model	: NX300		
Serial Number	: NX300PV-167		
Mode of Operation	: WLAN		
Duty Cycle	: 1(WLAN)		
Body worn Accessory	: None		
Tx Frequency Range	: 2412 MHz~ 2462 MHz (WLAN_11b/g/n) : 5180 MHz ~ 5240 MHz, 5260 MHz ~ 5320 MHz (WLAN_11a/n) : 5500 MHz ~ 5700 MHz, 5745 MHz ~ 5825 MHz (WLAN_11a/n)		
Battery Type	: 7.4V d.c. (Lithium-ion Battery)		
Equipment Class	Band	Measured Conducted Power [dB m]	Reported SAR
			1g Body-Worn (W/kg)
DTS	2.45 GHz WLAN	11.75	0.184
NUII	5.2 GHz WLAN	10.89	0.108
	5.3 GHz WLAN	10.41	0.221
	5.5 GHz WLAN	10.22	0.131
	5.8 GHz WLAN	10.45	< 0.1
Simultaneous SAR per KDB 690783 D01v01r02			N/A

1.5 Nominal and Maximum Output Power Specifications

This device operates using the following maximum and nominal output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 44798 D01v05.

Average power for Production					
Mode	Nominal & Maximum	a	b	g	n
802.11	Maximum	12	13	12	10
	Nominal	10	11	10	8

1.6 Test Environment

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

1.7 Operation Configuration

The client provided a special driver and test program which can control the frequency and power of the WLAN module. Measurements were performed at the lowest, middle and highest channels of the operating band. The EUT was set to maximum power level during all tests and at the beginning of each test the battery was fully charged.

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

1.8 EVALUATION PROCEDURES

- Power Reference Measurement Procedures

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The Minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. The minimum distance of probe sensors to surface is 2 mm. This distance cannot be smaller than the Distance of sensor calibration points to probe tip as defined in the probe properties (for example, 2.5 mm for an EX3DV4 probe type).

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

Step 2 and 3: Area Scan & Zoom Scan Procedures

The entire evaluation of the spatial peak values is performed within the Post-processing engine (SEMCAD).

The system always gives the maximum values for the 1 g and 10 g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

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

< Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01 >

		≤ 3 GHz	> 3 GHz	
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface		5 ± 1 mm	1/6 ln(2) ± 0.5 mm	
Maximum probe angle from probe axis to phantom surface normal at the measurement location		30° ± 1°	20° ± 1°	
Maximum area scan spatial resolution: $\Delta x_{Area}, \Delta y_{Area}$		≤ 2 GHz: ≤ 15 mm 2 - 3 GHz: ≤ 12 mm	3 - 4 GHz: ≤ 12 mm 4 - 6 GHz: ≤ 10 mm	
		When the x or y dimensions of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.		
Maximum zoom scan spatial resolution: $\Delta x_{Zoom}, \Delta y_{Zoom}$		≤ 2 GHz: ≤ 8 mm 2 - 3 GHz: ≤ 5 mm	3 - 4 GHz: ≤ 5 mm 4 - 6 GHz: ≤ 4 mm	
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid (distance)	≤ 8 mm	3 - 4 GHz: ≤ 4 mm 4 - 6 GHz: ≤ 3 mm 5 - 6 GHz: ≤ 2 mm	
	graded grid	$\Delta z_{Zoom}(1)$: between (1) st two points closest to phantom surface	≤ 4 mm	3 - 4 GHz: ≤ 3 mm 4 - 5 GHz: ≤ 2.5 mm 5 - 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(N-1)$: between subsequent points	≤ 1/5 $\Delta z_{Zoom}(1)$	
Minimum zoom scan volume	x, y, z	≥ 30 mm	3 - 4 GHz: ≥ 28 mm 4 - 5 GHz: ≥ 25 mm 5 - 6 GHz: ≥ 22 mm	
<small>Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details. [*] When zoom scan is required and the reported SAR from the area scan based J-g SAR estimation procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</small>				

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.

1.10 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 DASY4 professional system). A Model EX3DV4 3862 and ET3DV6 E-field probe is used to determine the internal electric fields. The SAR can be obtained from the equation $SAR = \sigma (|E_i|^2) / \rho$ 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.

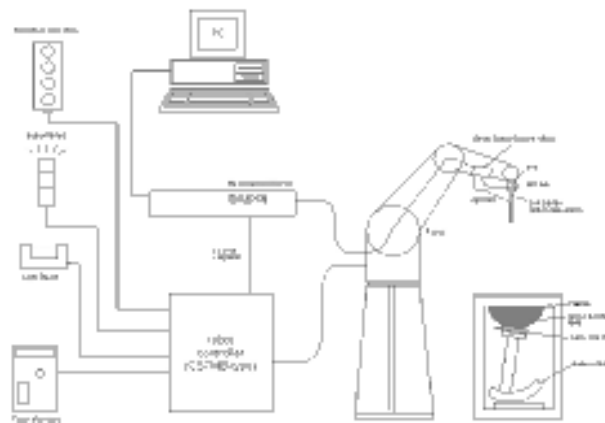


Fig a. The microwave circuit arrangement used for SAR system verification

- 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 7.
- DASY4 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM 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.

1.11 System Components

EX3DV4 E-Field Probe

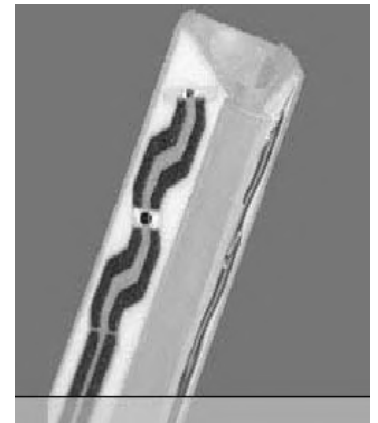
- Construction** : Symmetrical design with triangular core.
 Built-in shielding against static charges.
 PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
- Calibration** : Basic Broad Band Calibration in air Conversion Factors (CF) for HSL 835 and HSL1900.
 Additional CF-Calibration for other liquids and frequencies upon request.
- Frequency** : 10 MHz to 6 GHz; Linearity: ± 0.2 dB (30 MHz to 6 GHz)
- Directivity** : ± 0.3 dB in HSL (rotation around probe axis)
 ± 0.5 dB in tissue material (rotation normal to probe axis)
- Dynamic Range** : 10 μ W/g to > 100 mW/g;
 Linearity: ± 0.2 dB(noise: typically < 1 μ W/g)
- Dimensions** : Overall length: 337 mm (Tip length: 20 mm)
 Tip diameter: 2.5 mm (Body diameter: 12 mm)
 Distance from probe tip to dipole centers: 1 mm
- Application** : High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%
- Construction** : Symmetrical design with triangular core.
 Built-in shielding against static charges.
 PEEK enclosure material (resistant to organic solvents, e.g., DGBE)



EX3DV4 E-Field Probe

ET3DV6 E-Field Probe

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



ET3DV6 E-Field Probe

NOTE:

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

SAM Phantom

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



SAM Phantom

Shell Thickness: 2.0 mm ± 0.1 mm

Filling Volume: Approx. 25 liters

DEVICE HOLDER

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



Device Holder

1.12 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 2450 MHz, 5.2 GHz, 5.3 GHz, 5.5 GHz, 5.8 GHz. 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.

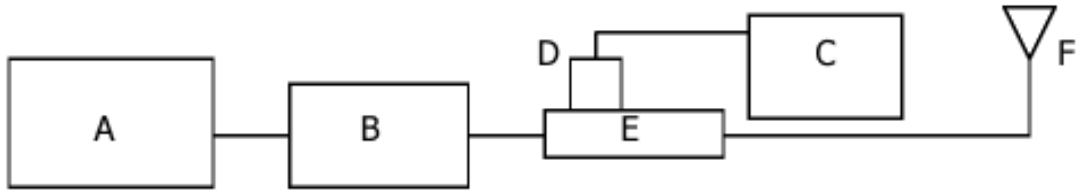


Fig b. The microwave circuit arrangement used for SAR system verification

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



Photo of the dipole Antenna

System Validation Results

Validation Kit	Tissue	Target SAR 1 g from Calibration Certificate (1 W)	Measured SAR 1 g (0.1 W)	Measured SAR 1 g (1 W)	Deviation (%)	Date	Liquid Temp. (°C)
D2450V2 S/N: 734	2450 MHz Body	50.2 W/kg	5.20 W/kg	52.0 W/kg	3.59	2013-01-23	22.6
D5 GHz V2 S/N: 1130	5200 MHz Body	75.1 W/kg	7.98 W/kg	79.8 W/kg	6.26	2013-01-24	22.9
	5500 MHz Body	78.7 W/kg	8.02 W/kg	80.2 W/kg	1.91	2013-01-25	22.4
	5800 MHz Body	74.7 W/kg	7.76 W/kg	77.6 W/kg	3.88	2013-01-25	22.4

Table 1. Results system validation

1.13 Tissue Simulant Fluid for the Frequency Band

The dielectric properties for this simulant fluid were measured by using the Agilent Model 85070D Dielectric Probe (rates frequency band 200 MHz to 20 GHz) in conjunction with Agilent E5070B Network Analyzer(300 kHz - 3 GHz) by using a procedure detailed in Section V.

f (MHz)	Tissue type	Limits / Measured	Dielectric Parameters		
			Permittivity	Conductivity	Simulated Tissue Temp(℃)
2450	Body	Measured, 2013-01-23	50.7	1.94	22.6
		Recommended Limits	52.7	1.95	21.0 ~ 23.0
		<u>Deviation(%)</u>	<u>-3.80</u>	<u>-0.51</u>	-
2412		Measured, 2013-01-23	50.8	1.89	23.1
		<u>Deviation(%)</u>	<u>-3.61</u>	<u>-3.08</u>	-
2462		Measured, 2013-01-23	50.7	1.96	23.1
	<u>Deviation(%)</u>	<u>-3.80</u>	<u>0.51</u>	-	
5200	Body	Measured, 2013-01-24	47.7	5.20	22.9
		Recommended Limits	49.0	5.30	21.0 ~ 23.0
		<u>Deviation(%)</u>	<u>-2.65</u>	<u>-1.89</u>	-
5180		Measured, 2013-01-24	47.7	5.17	21.8
		<u>Deviation(%)</u>	<u>-2.65</u>	<u>-2.45</u>	-
5300		Measured, 2013-01-24	47.5	5.30	21.8
	<u>Deviation(%)</u>	<u>-3.06</u>	<u>0.00</u>	-	
5500	Body	Measured, 2013-01-25	47.8	5.51	22.4
		Recommended Limits	48.6	5.65	21.0 ~ 23.0
		<u>Deviation(%)</u>	<u>-1.65</u>	<u>-2.48</u>	-
5520		Measured, 2013-01-25	47.6	5.53	22.7
		<u>Deviation(%)</u>	<u>-2.06</u>	<u>-2.12</u>	-
5580		Measured, 2013-01-25	47.6	5.66	22.7
		Recommended Limits	48.5	5.77	21.0 ~ 23.0
		<u>Deviation(%)</u>	<u>-1.86</u>	<u>-1.91</u>	-
5660		Measured, 2013-01-25	47.5	5.72	22.7
		Recommended Limits	48.3	5.88	21.0 ~ 23.0
		<u>Deviation(%)</u>	<u>-1.66</u>	<u>-2.72</u>	-
5680		Measured, 2013-01-25	47.5	5.76	22.7
	<u>Deviation(%)</u>	<u>-1.66</u>	<u>-2.04</u>	-	
5700	Measured, 2013-01-25	47.5	5.79	22.7	
	<u>Deviation(%)</u>	<u>-1.66</u>	<u>-1.53</u>	-	
5800	Measured, 2013-01-25	47.3	5.90	22.4	
	Recommended Limits	48.2	6.00	21.0 ~ 23.0	
	<u>Deviation(%)</u>	<u>-1.87</u>	<u>-1.67</u>	-	
5745	Measured, 2013-01-25	47.4	5.82	22.8	
	<u>Deviation(%)</u>	<u>-1.66</u>	<u>-3.00</u>	-	
5825	Measured, 2013-01-25	47.3	5.93	22.8	
	<u>Deviation(%)</u>	<u>-1.86</u>	<u>-1.17</u>	-	

The composition of the brain tissue simulating liquid

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

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

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

1.14 Test Standards and Limits

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

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

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

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

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

Table .2 RF exposure limits

2. Instruments List

Maunfacturer	Device	Type	Serial Number	Due date of Calibration
Stäubli	Robot	RX90BL	F12/5LP8A1/01	N/A
Schmid & Partner Engineering AG	Dosimetric E-Field Probe	EX3DV4	3791	May 23, 2013
Schmid & Partner Engineering AG	Dosimetric E-Field Probe	ET3DV6	1782	April 27, 2013
Schmid & Partner Engineering AG	2450 Mhz System Validation Dipole	D2450V2	734	May 17, 2014
Schmid & Partner Engineering AG	5000 Mhz System Validation Dipole	D5 GHz V2	1130	July 02, 2014
Schmid & Partner Engineering AG	Data acquisition Electronics	DAE4	534	September 06, 2013
Schmid & Partner Engineering AG	Software	DASY 4 V52.8.01	-	N/A
Schmid & Partner Engineering AG	Phantom	SAM Phantom V4.0	TP-1300	N/A
			TP-1645	
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	September 18, 2013
			MY41495307	September 18, 2013
Agilent	Signal Generator	E4421B	MY42082477	March 29, 2013
Empower RF Systems	Power Amplifier	2092-BBS5K8CAJ	1010	September 17, 2013
Empower RF Systems	Power Amplifier	2001-BBS3Q7ECK	1032 D/C 0336	March 31, 2013
Agilent	Directional RF Bridges	86205A	MY31402302	July 03, 2013
Microlab	LP Filter	LA-30N LA-60N	N/A	September 14, 2013
R & S	Spectrum Analyzer	FSV30	100768	March 29, 2013
Agilent	Attenuator	8491B	50566	September 14, 2013

3.Summary of Results

3.1 FCC Power Measurement Procedures

Power measurements were performed using a base station simulator under digital average power.

The handset was placed into a simulated call using a base station simulator in shielded chamber. SAR measurements were taken with a fully charged battery. 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 Measured and Reported SAR

Per FCC KDB Publication 447498 D01v05, When SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. For simultaneous transmission, the measured aggregate SAR must be scaled according to the sum of the differences between the maximum tune-up tolerance and actual power used to test each transmitter. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as reported SAR. Test highest reported SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r02.

3.3 RF Conducted Power

WLAN

802.11b Mode		Rated	Measured Power
Frequency (MHz)	Channel No.	(Mbps)	(dB m)
2412	1	1	11.58
		2	11.43
		5.5	11.52
		11	11.42
2437	6	1	11.75
		2	11.69
		5.5	11.54
		11	11.37
2462	11	1	11.54
		2	11.50
		5.5	11.45
		11	11.41

802.11g Mode		Rated	Measured Power
Frequency (MHz)	Channel No.	(Mbps)	(dB m)
2412	1	6	10.27
		9	10.16
		12	10.18
		18	10.11
		24	10.05
		36	10.13
		48	10.24
		54	10.15
2437	6	6	10.22
		9	10.16
		12	10.02
		18	9.89
		24	9.82
		36	9.75
		48	9.64
		54	9.56
2462	11	6	10.64
		9	10.52
		12	10.36
		18	10.21
		24	10.09
		36	9.98
		48	9.94
		54	9.87

802.11n_HT20 Mode		Rated	Measured Power
Frequency (MHz)	Channel No.	(Mbps)	(dB m)
2412	1	MCS0	8.14
		MCS1	8.26
		MCS2	8.35
		MCS3	8.27
		MCS4	8.18
		MCS5	8.05
		MCS6	8.24
		MCS7	8.36
2437	6	MCS0	7.95
		MCS1	7.86
		MCS2	7.85
		MCS3	7.74
		MCS4	7.69
		MCS5	7.62
		MCS6	7.64
		MCS7	7.55
2462	11	MCS0	8.05
		MCS1	8.01
		MCS2	8.32
		MCS3	8.09
		MCS4	8.12
		MCS5	8.14
		MCS6	8.13
		MCS7	8.11

5.2 GHz

802.11a_Mode		Rated (Mbps)	Measured Power (dB m)
Frequency (MHz)	Channel No.		
5180	36	6	10.15
5200	40	6	10.46
5220	44	6	9.78
5240	48	6	<u>10.89</u>
802.11n_HT20 Mode		Rated (Mbps)	Measured Power (dB m)
Frequency (MHz)	Channel No.		
5180	36	MCS0	9.48
5200	40	MCS0	10.59
5220	44	MCS0	10.21
5240	48	MCS0	10.52
802.11n_HT40 Mode		Rated (Mbps)	Measured Power (dB m)
Frequency (MHz)	Channel No.		
5190	38	MCS0	9.53
5230	46	MCS0	11.01

5.3 GHz

802.11a_Mode		Rated (Mbps)	Measured Power (dB m)
Frequency (MHz)	Channel No.		
5260	52	6	<u>10.41</u>
5280	56	6	10.02
5300	60	6	10.18
5320	64	6	10.08
802.11n_HT20 Mode		Rated (Mbps)	Measured Power (dB m)
Frequency (MHz)	Channel No.		
5260	52	MCS0	10.17
5280	56	MCS0	10.11
5300	60	MCS0	9.83
5320	64	MCS0	9.96
802.11n_HT40 Mode		Rated (Mbps)	Measured Power (dB m)
Frequency (MHz)	Channel No.		
5270	54	MCS0	10.55
5310	62	MCS0	10.16

5.5 GHz

802.11a Mode		Rated (Mbps)	Measured Power (dB m)
Frequency (MHz)	Channel No.		
5500	100	6	9.83
5520	104	6	10.20
5540	108	6	9.61
5560	112	6	10.22
5580	116	6	9.51
5600	120	6	9.85
5620	124	6	9.35
5640	128	6	9.49
5660	132	6	9.04
5680	136	6	8.78
5700	140	6	9.96
802.11n HT20 Mode		Rated (Mbps)	Measured Power (dB m)
Frequency (MHz)	Channel No.		
5500	100	MCS0	9.44
5520	104	MCS0	9.24
5540	108	MCS0	9.40
5560	112	MCS0	9.45
5580	116	MCS0	9.35
5600	120	MCS0	9.21
5620	124	MCS0	9.14
5640	128	MCS0	8.91
5660	132	MCS0	8.70
5680	136	MCS0	8.77
5700	140	MCS0	9.56
802.11n HT40 Mode		Rated (Mbps)	Measured Power (dB m)
Frequency (MHz)	Channel No.		
5510	102	MCS0	10.07
5550	110	MCS0	10.14
5590	118	MCS0	9.85
5630	130	MCS0	9.22
5670	134	MCS0	8.95

5.5 GHz

802.11a Mode		Rated (Mbps)	Measured Power (dB m)
Frequency (MHz)	Channel No.		
5745	149	6	10.44
5765	153	6	10.36
5785	157	6	<u>10.45</u>
5805	161	6	9.85
5825	165	6	9.91
802.11n_HT20 Mode		Rated (Mbps)	Measured Power (dB m)
Frequency (MHz)	Channel No.		
5745	149	MCS0	9.78
5765	153	MCS0	10.15
5785	157	MCS0	9.98
5805	161	MCS0	9.80
5825	165	MCS0	9.36
802.11n_HT40 Mode		Rated (Mbps)	Measured Power (dB m)
Frequency (MHz)	Channel No.		
5755	151	MCS0	9.94
5795	159	MCS0	10.15

3.4 SAR Test Exclusions Applied

Per FCC KDB 447498 D01v05, the SAR exclusion threshold for distances < 50 mm is defined by the following equation:

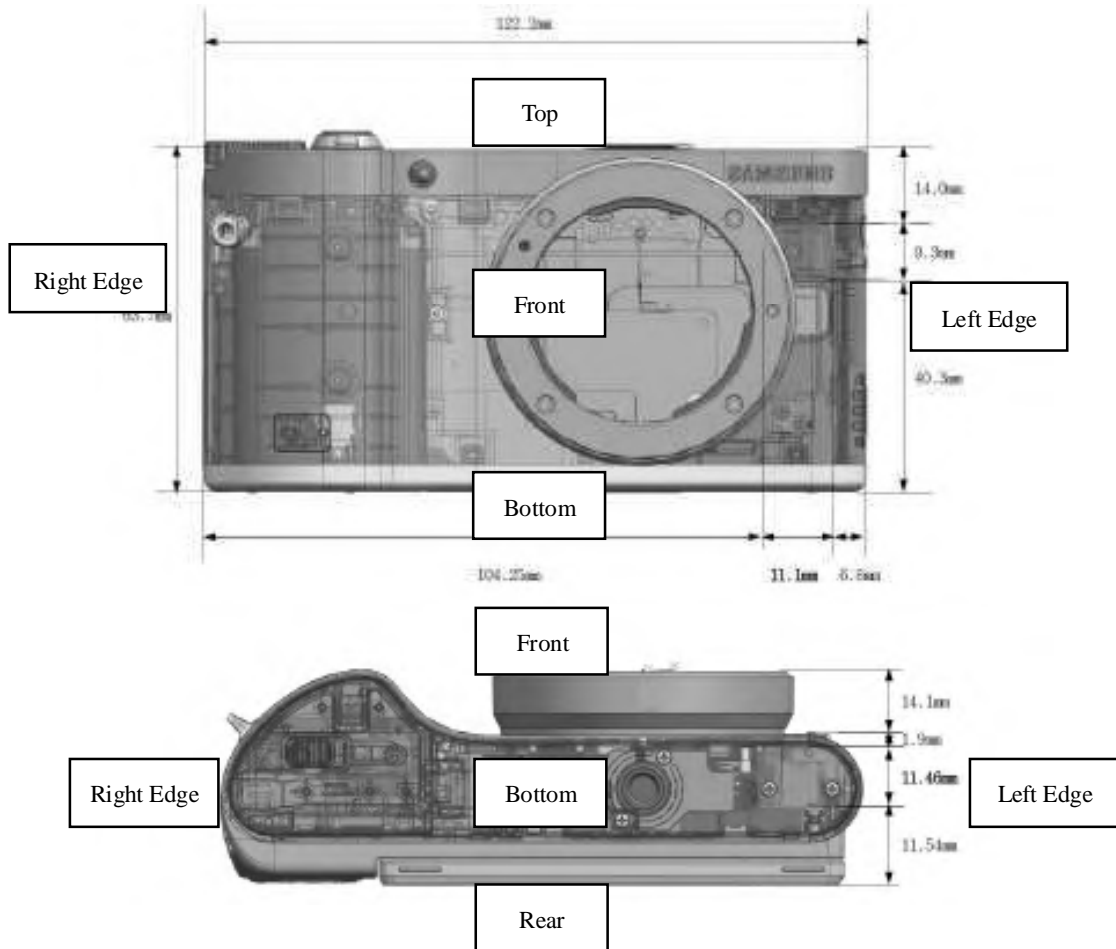
$$\frac{\text{Max Power of Channel (mW)}}{\text{Test Separation Distance (mm)}} * \sqrt{\text{Frequency(GHz)}} \leq 3.0$$

Per FCC KDB 447498 D01v05, At 100 MHz to 6 GHz and for test separation distances > 50 mm, the SAR test exclusion threshold is determined according to the following

$$[(\text{Threshold at 50 mm in step 1}) + (\text{test separation distance} - 50 \text{ mm}) * 10] \text{ mW}$$

at > 1500 MHz and ≤ 6 GHz

<The Distance information of Antenna to Edges of EUT>



< Per FCC KDB 447498 D01v05, the WWAN and WLAN antenna are required to be test reduction >

Position		802.11b	802.11a 5.2GHz	802.11a 5.3GHz	802.11a 5.5GHz	802.11a 5.8GHz
Max Power of Channel (mW)						
Front	Antenna to User (mm)	16.00				
	SAR exclusion threshold (mW)	30.66	21.04	20.84	20.46	19.3
	SAR Test reduction	No	No	No	No	No
Rear	Antenna to User (mm)	11.54				
	SAR exclusion threshold (mW)	22.11	15.18	15.03	14.76	14.37
	SAR Test reduction	Yes, IC(RSS 102) standard SAR test position				
Right Edge	Antenna to User (mm)	104.25				
	SAR exclusion threshold (mW)	738.5	708.5	708.5	707.5	704.5
	SAR Test reduction	No	No	No	No	No
Left Edge	Antenna to User (mm)	6.80				
	SAR exclusion threshold (mW)	13.03	8.94	8.86	8.69	8.47
	SAR Testing required	Yes				
Top	Antenna to User (mm)	14.00				
	SAR exclusion threshold (mW)	26.83	18.41	18.24	17.90	17.43
	SAR Testing required	No	No	No	No	No
Bottom	Antenna to User (mm)	40.30				
	SAR exclusion threshold (mW)	77.24	53.01	52.51	51.55	50.20
	SAR Testing required	No	No	No	No	No

Notes:

1. Per KDB 447498 D01v05, standalone SAR test exclusion threshold is applied; If the distance of the antenna to the user is < 5mm, 5mm is used to determine SAR exclusion threshold

3.5 SAR Data Summary

Ambient Temperature (°C)	23.4	23.8	23.4
Liquid Temperature (°C)	22.6	22.9	22.4
Date	2013-01-23	2013-01-24	2013-01-25

WLAN Body SAR

Test Mode	EUT Position	Data Rate	Traffic Channel		Distance (mm)	Measured Power [dB m]	Tune-Up Limit [dB m]	Power Drift(dB)	1 g SAR (W/kg)	Scaling Factor	Scaling SAR (1g)	1 g SAR Limits (W/kg)
			Frequency (MHz)	Channel								
802.11b	Left Edge	1	2437	6	5	11.75	13.00	-0.012	0.138	1.334	0.184	1.6
	Rear	1	2462	6	5	11.75	13.00	0.056	0.060	1.334	0.008	
802.11a 5.2 GHz	Left Edge	6	5240	48	5	10.89	12.00	-0.050	0.084	1.291	0.108	
	Rear	6	5240	48	5	10.89	12.00	0.189	0.006	1.291	0.008	
802.11a 5.3 GHz	Left Edge	6	5260	52	5	10.41	12.00	0.083	0.153	1.442	0.221	
	Rear	6	5260	52	5	10.41	12.00	-0.075	0.002	1.442	0.003	
802.11a 5.5 GHz	Left Edge	6	5560	112	5	10.22	12.00	-0.121	0.087	1.507	0.131	
	Rear	6	5560	112	5	10.22	12.00	0.000	0.015	1.507	0.023	
802.11a 5.8 GHz	Left Edge	6	5785	157	5	10.45	12.00	0.191	0.046	1.429	0.066	
	Rear	6	5785	157	5	10.45	12.00	N/A				

Notes

- The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2003, FCC/OET Bulletin 65, Supplement C [June 2001] and FCC KDB Publication 447498 D01v05.
- All modes of operation were investigated, and worst-case results are reported.
- Battery is fully charged for all readings and the standard batteries are the only options.
- The EUT is tested 2nd hot-spot peak, if it is less than 2 dB below the highest peak.
- The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
- SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v05.
- Justification for reduced test configuration for WIFI channels per KDB Publication 248227 and April 2010 FCC/TCB Meeting
 Notes: Highest average RF output power channel for the lowest data rate were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11n and higher data rates) were not investigated since the average output powers were not greater than 0.25 dB than that of the corresponding channel in the lowest data rate IEEE 802.11a modes
- WLAN transmission was verified using a spectrum analyzer.
- Since the maximum extrapolated peak SAR of the zoom scan for the maximum output channel is < 1.6 W/kg and the reported 1g averaged SAR is < 0.8 W/kg, SAR testing on other default channels was not required.
- Rear Position tested according to RSS-102 (Issue 4) standard.
- The "N/A" means there is no SAR value or the SAR is too low to be measured.

Appendix

List

Appendix A	DASY4 Report (Plots of the SAR Measurements)	- 2450 MHz, 5.2 GHz, 5.5 GHz, 5.8 GHz Validation Test - WLAN Test
Appendix B	Uncertainty Analysis	
Appendix C	Calibration Certificate	- PROBE - DAE - DIPOLE



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Appendix A

Test Plot – DASy4 Report

2450 MHz Validation Test_Body

Date: 2013-01-23

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

Input Power : 100 mW

Ambient Temp : 23.4 °C Tissue Temp : 22.6 °C

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:734
Program Name: Validation 2450 MHz_Body

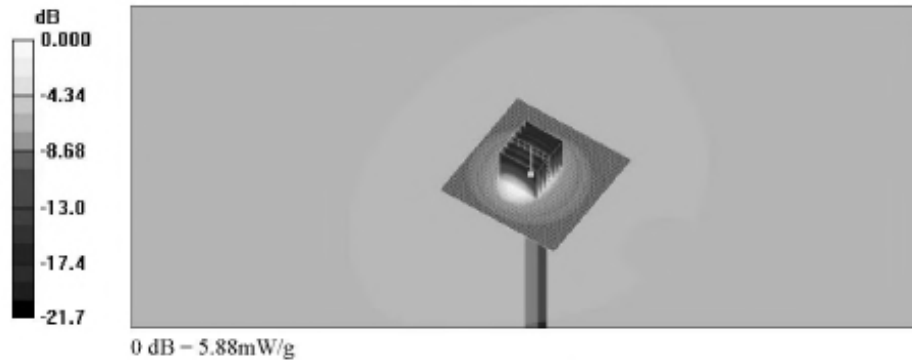
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 2450$ MHz; $\sigma = 1.94$ mho/m; $\epsilon_r = 50.7$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section

DASY4 Configuration:

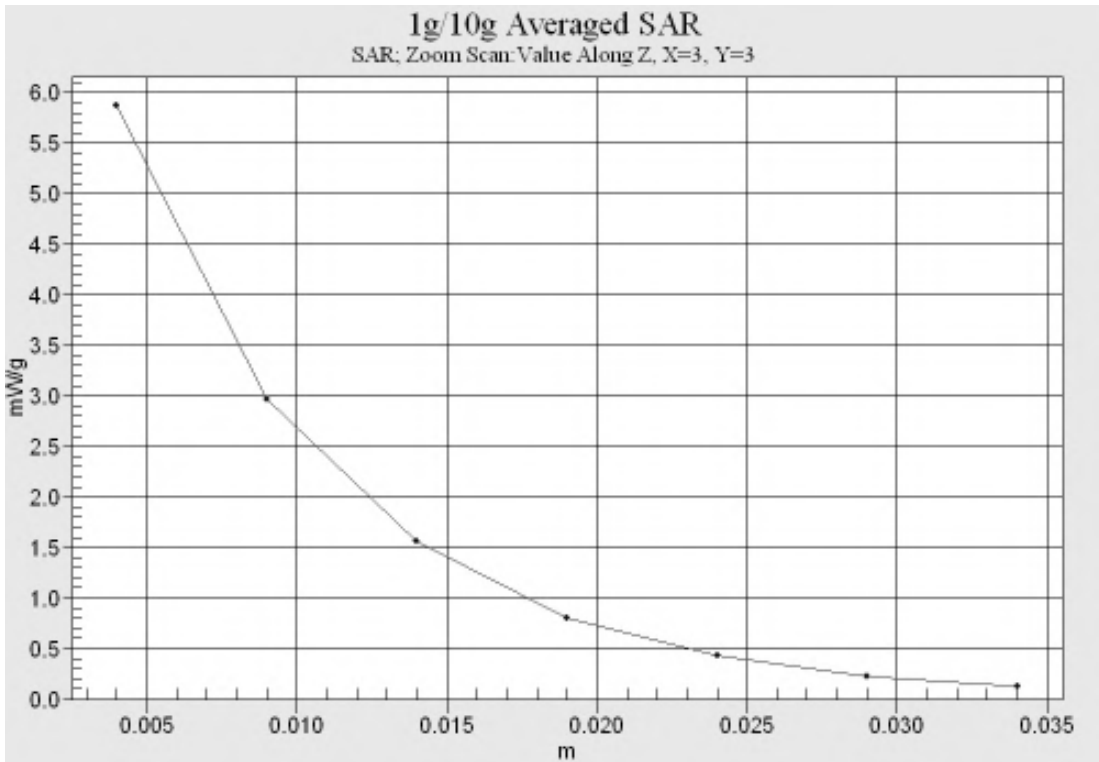
- Probe: ET3DV6 - SN1782; ConvF(4.11, 4.11, 4.11); Calibrated: 2012-04-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn534; Calibrated: 2012-09-06
- Phantom: SAM with CRP_2011(left); Type: SAM; Serial: TP-1645
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Validation 2450 MHz_Body/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
 Maximum value of SAR (interpolated) = 6.16 mW/g

Validation 2450 MHz_Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
 Reference Value = 56.1 V/m; Power Drift = -0.052 dB
 Peak SAR (extrapolated) = 10.9 W/kg
SAR(1 g) = 5.2 mW/g; SAR(10 g) = 2.43 mW/g
 Maximum value of SAR (measured) = 5.88 mW/g



Z-Scan



5.2 GHz Validation Test_Body

Date: 2013-01-24

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

Input Power : 100 mW

Ambient Temp : 23.8 °C Tissue Temp : 22.9 °C

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

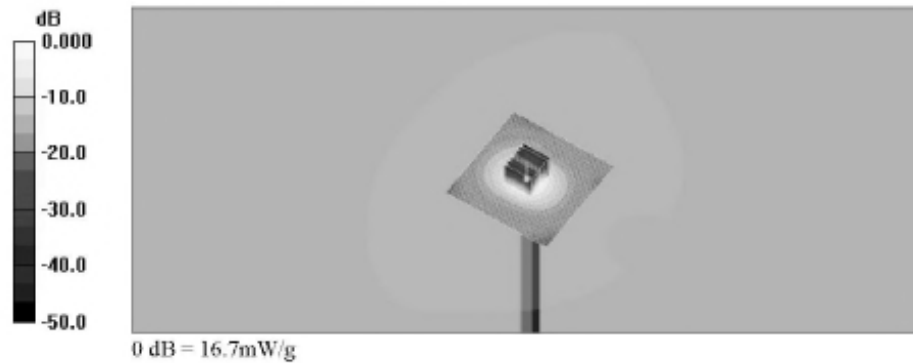
Communication System: CW; Frequency: 5200 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 5200$ MHz; $\sigma = 5.2$ mho/m; $\epsilon_r = 47.7$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section

DASY4 Configuration:

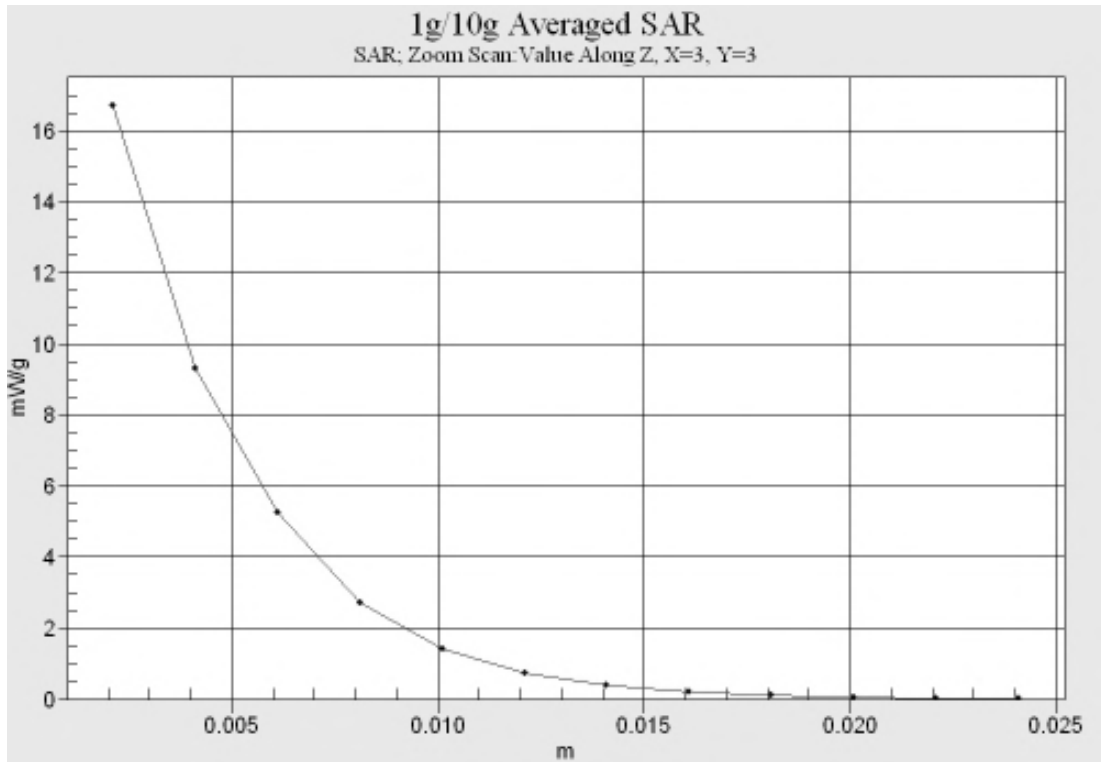
- Probe: EX3DV4 - SN3791; ConvF(4, 4, 4); Calibrated: 2012-05-23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn534; Calibrated: 2012-09-06
- Phantom: SAM MIC #2000-93 with CRP_Right; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing 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 = 50.7 V/m; Power Drift = -0.010 dB
 Peak SAR (extrapolated) = 32.2 W/kg
SAR(1 g) = 7.98 mW/g; SAR(10 g) = 2.24 mW/g
 Maximum value of SAR (measured) = 16.7 mW/g



Z-Scan



5.5 GHz Validation Test_Body

Date: 2013-01-25

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

Input Power : 100 mW

Ambient Temp : 23.4 °C Tissue Temp : 22.4 °C

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

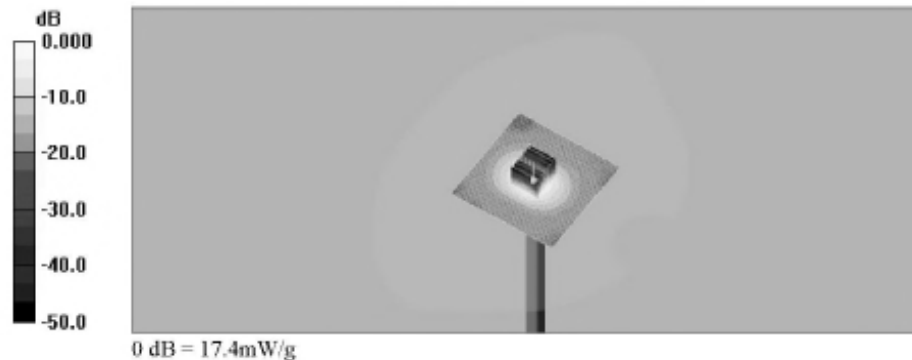
Communication System: CW; Frequency: 5500 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 5500$ MHz; $\sigma = 5.51$ mho/m; $\epsilon_r = 47.8$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section

DASY4 Configuration:

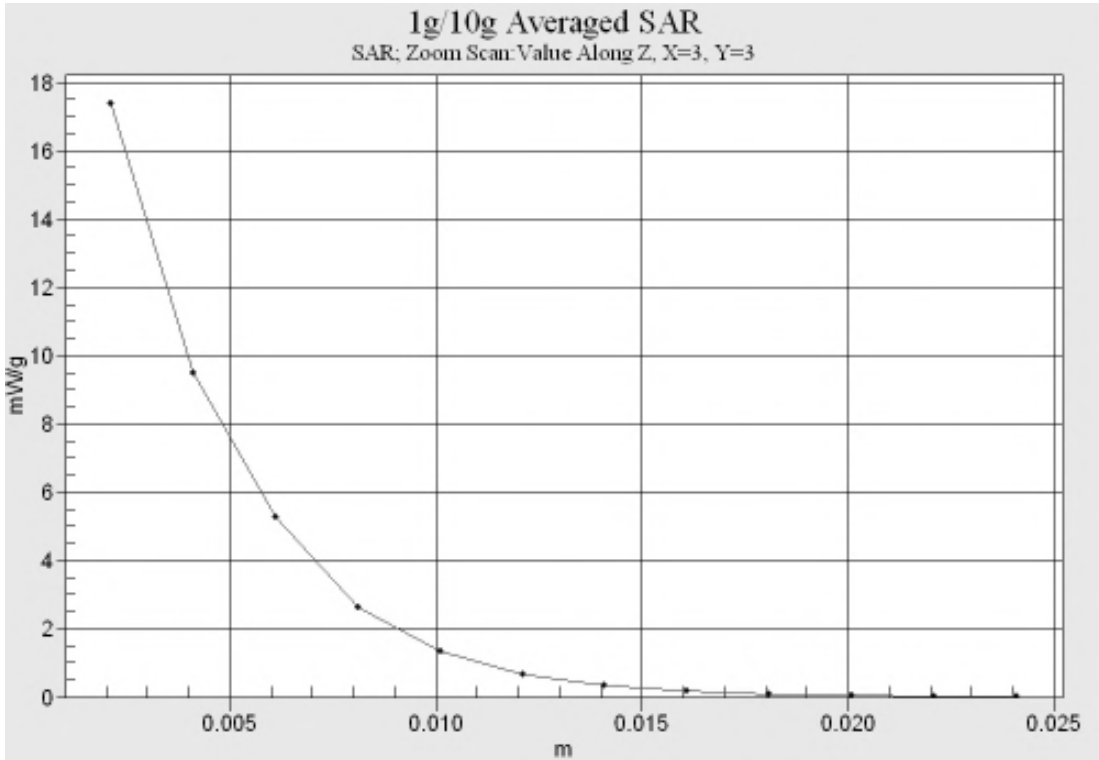
- Probe: EX3DV4 - SN3791; ConvF(3.64, 3.64, 3.64); Calibrated: 2012-05-23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn534; Calibrated: 2012-09-06
- Phantom: SAM MIC #2000-93 with CRP_Right; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Validation/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
 Maximum value of SAR (interpolated) = 17.8 mW/g

Validation/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
 Reference Value = 51.4 V/m; Power Drift = 0.091 dB
 Peak SAR (extrapolated) = 33.2 W/kg
SAR(1 g) = 8.02 mW/g; SAR(10 g) = 2.21 mW/g
 Maximum value of SAR (measured) = 17.4 mW/g



Z-Scan



5.8 GHz Validation Test_Body

Date: 2013-01-25

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

Input Power : 100 mW

Ambient Temp : 23.4 °C Tissue Temp : 22.4 °C

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

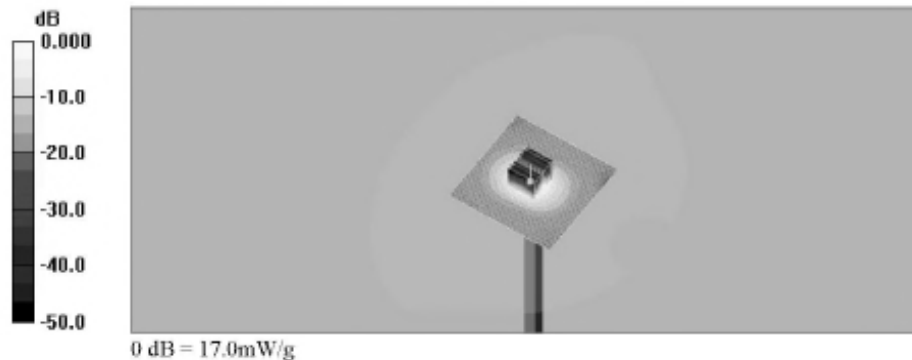
Communication System: CW; Frequency: 5800 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 5800$ MHz; $\sigma = 5.9$ mho/m; $\epsilon_r = 47.3$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section

DASY4 Configuration:

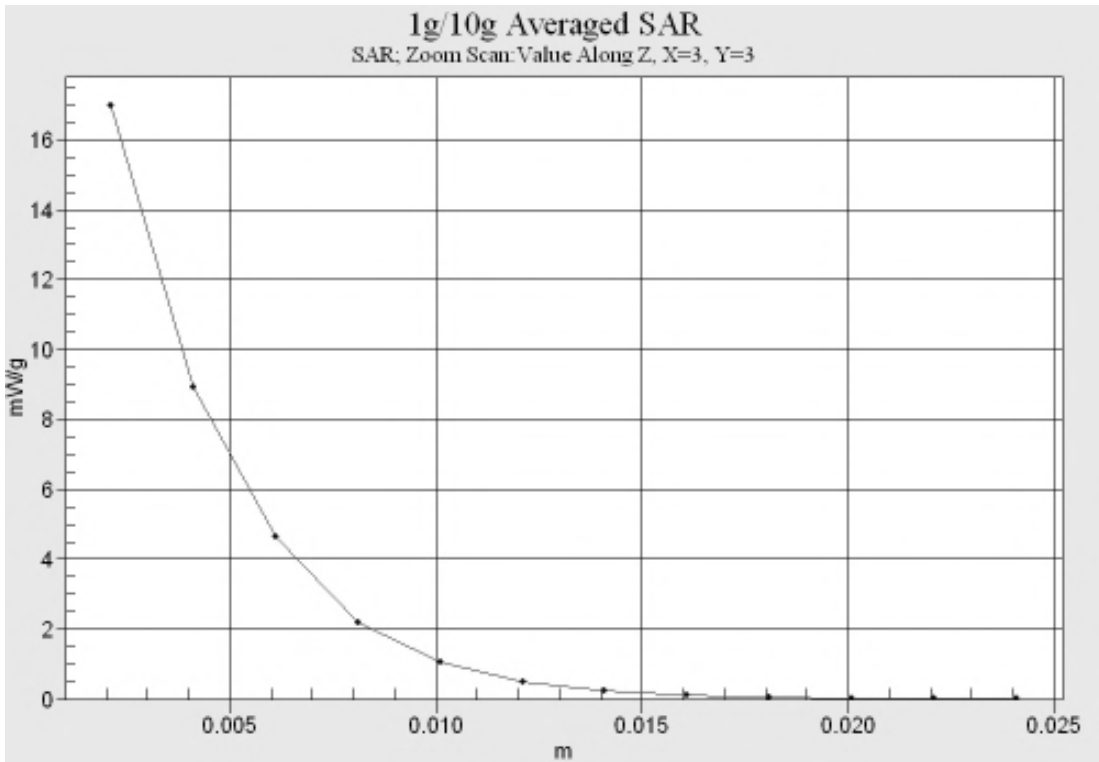
- Probe: EX3DV4 - SN3791; ConvF(3.79, 3.79, 3.79); Calibrated: 2012-05-23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn534; Calibrated: 2012-09-06
- Phantom: SAM MIC #2000-93 with CRP_Right; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Validation/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
 Maximum value of SAR (interpolated) = 17.4 mW/g

Validation/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
 Reference Value = 46.5 V/m; Power Drift = -0.077 dB
 Peak SAR (extrapolated) = 33.4 W/kg
SAR(1 g) = 7.76 mW/g; SAR(10 g) = 2.13 mW/g
 Maximum value of SAR (measured) = 17.0 mW/g



Z-Scan



WLAN Body SAR Test

Date: 2013-01-23

Test Laboratory: SGS Korea (Gunpo Laboratory)
 File Name: Wi-Fi_Left_1MBps_CH6.da4

Ambient Temp : 23.4 °C Tissue Temp : 22.6 °C

DUT: NX300; Type: Digital Camera; Serial: NX300PV-167
Program Name: WLAN_Body

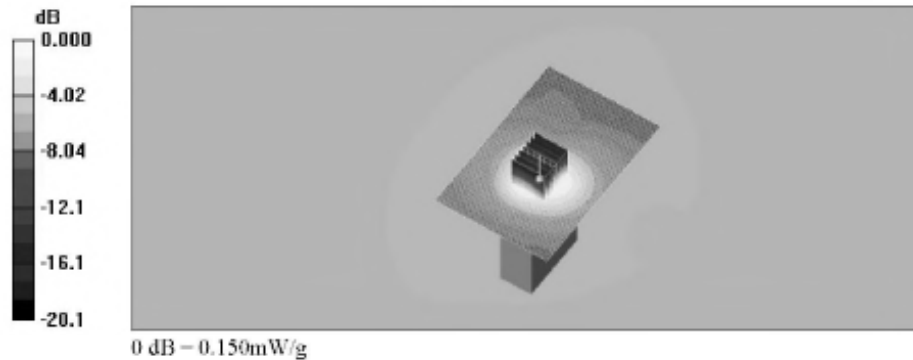
Communication System: WLAN; Frequency: 2437 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 2437 \text{ MHz}$; $\sigma = 1.92 \text{ mho/m}$; $\epsilon_r = 50.7$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section

DASY4 Configuration:

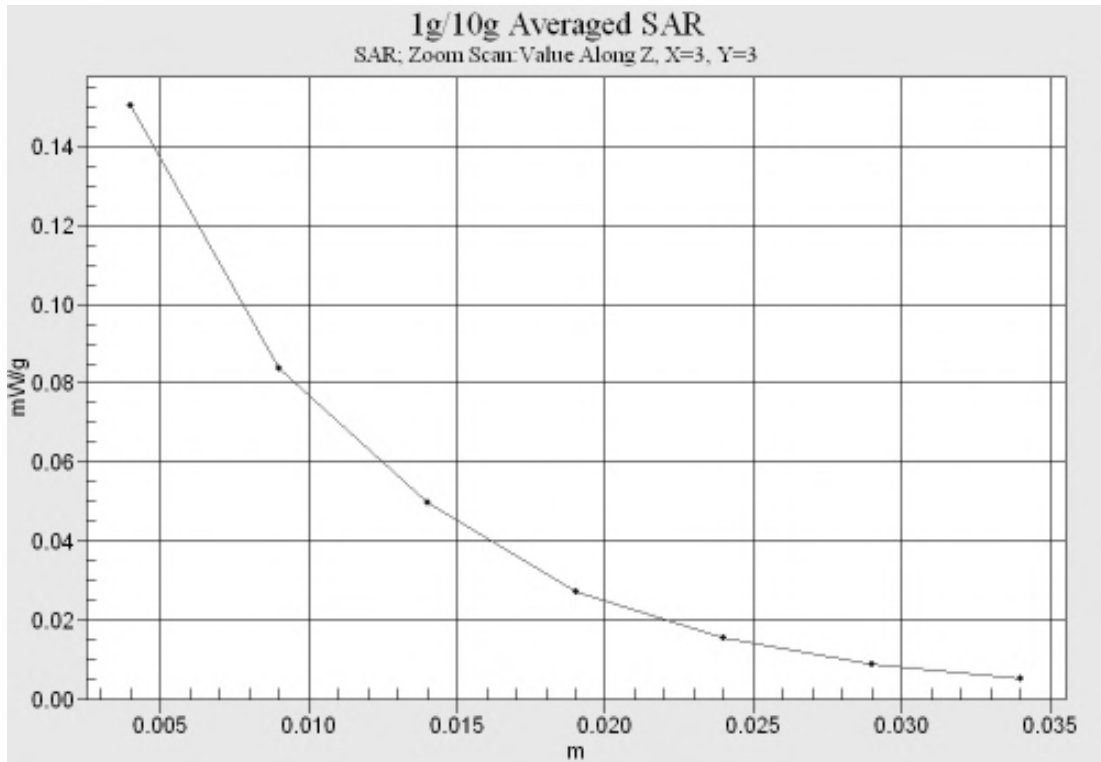
- Probe: ET3DV6 - SN1782; ConvF(4.11, 4.11, 4.11); Calibrated: 2012-04-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn534; Calibrated: 2012-09-06
- Phantom: SAM with CRP_2011(left); Type: SAM; Serial: TP-1645
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

WLAN_Left_Mid gep 5mm/Area Scan (101x151x1): Measurement grid: dx=10mm, dy=10mm
 Maximum value of SAR (interpolated) = 0.155 mW/g

WLAN_Left_Mid gep 5mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
 Reference Value = 8.34 V/m; Power Drift = -0.012 dB
 Peak SAR (extrapolated) = 0.263 W/kg
SAR(1 g) = 0.138 mW/g; SAR(10 g) = 0.074 mW/g
 Maximum value of SAR (measured) = 0.150 mW/g



Z-Scan



Date: 2013-01-23

Test Laboratory: SGS Korea (Gunpo Laboratory)
 File Name: Wi-Fi_Rear_1Mbps_CH6.da4

Ambient Temp : 23.4 °C Tissue Temp : 22.6 °C

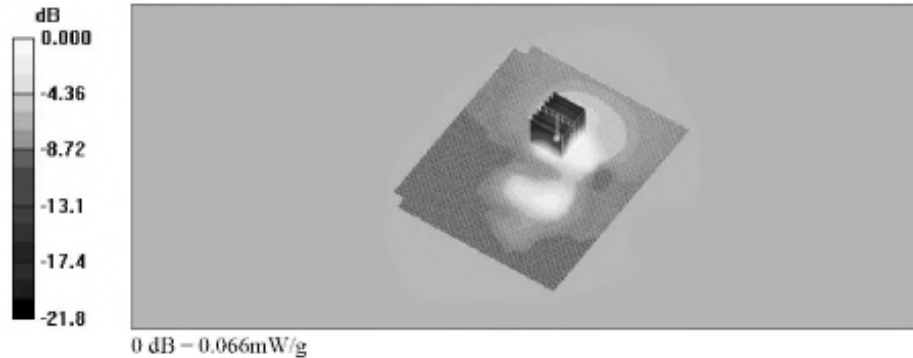
DUT: NX300; Type: Digital Camera; Serial: NX300PV-167
Program Name: WLAN_Body

Communication System: WLAN; Frequency: 2437 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 2437$ MHz; $\sigma = 1.92$ mho/m; $\epsilon_r = 50.7$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section

DASY4 Configuration:
 - Probe: ET3DV6 - SN1782; ConvF(4.11, 4.11, 4.11); Calibrated: 2012-04-27
 - Sensor-Surface: 4mm (Mechanical Surface Detection)
 - Electronics: DAE4 Sn534; Calibrated: 2012-09-06
 - Phantom: SAM with CRP_2011(left); Type: SAM; Serial: TP-1645
 - Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

WLAN_Rear_Mid gep 5mm/Area Scan (151x181x1): Measurement grid: dx=10mm,
 dy=10mm
 Maximum value of SAR (interpolated) = 0.064 mW/g

WLAN_Rear_Mid gep 5mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm,
 dy=5mm, dz=5mm
 Reference Value = 1.70 V/m; Power Drift = 0.056 dB
 Peak SAR (extrapolated) = 0.113 W/kg
 SAR(1 g) = 0.060 mW/g; SAR(10 g) = 0.031 mW/g
 Maximum value of SAR (measured) = 0.066 mW/g



Date: 2013-01-24

Test Laboratory: SGS Korea (Gunpo Laboratory)
 File Name: 5.2GHz_Left Edge_6Mbps_CH48.da4

Ambient Temp : 23.8 °C Tissue Temp : 22.9 °C

DUT: NX300; Type: Digital Camera; Serial: NX300PV-167
Program Name: WLAN_Body

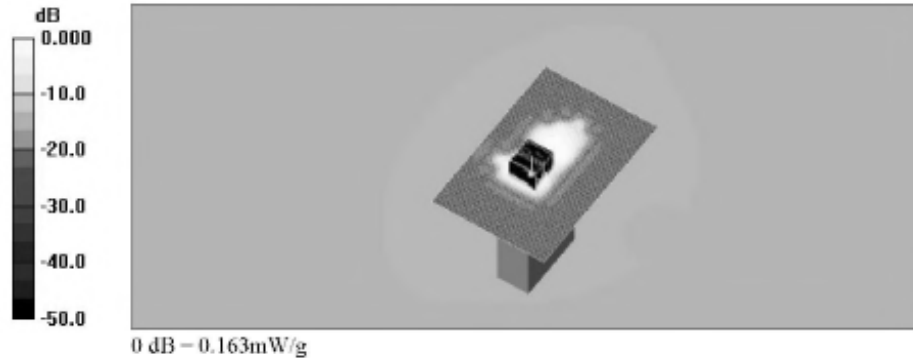
Communication System: WLAN(11a_U-NII Low); Frequency: 5240 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 5240$ MHz; $\sigma = 5.23$ mho/m; $\epsilon_r = 47.6$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section

DASY4 Configuration:

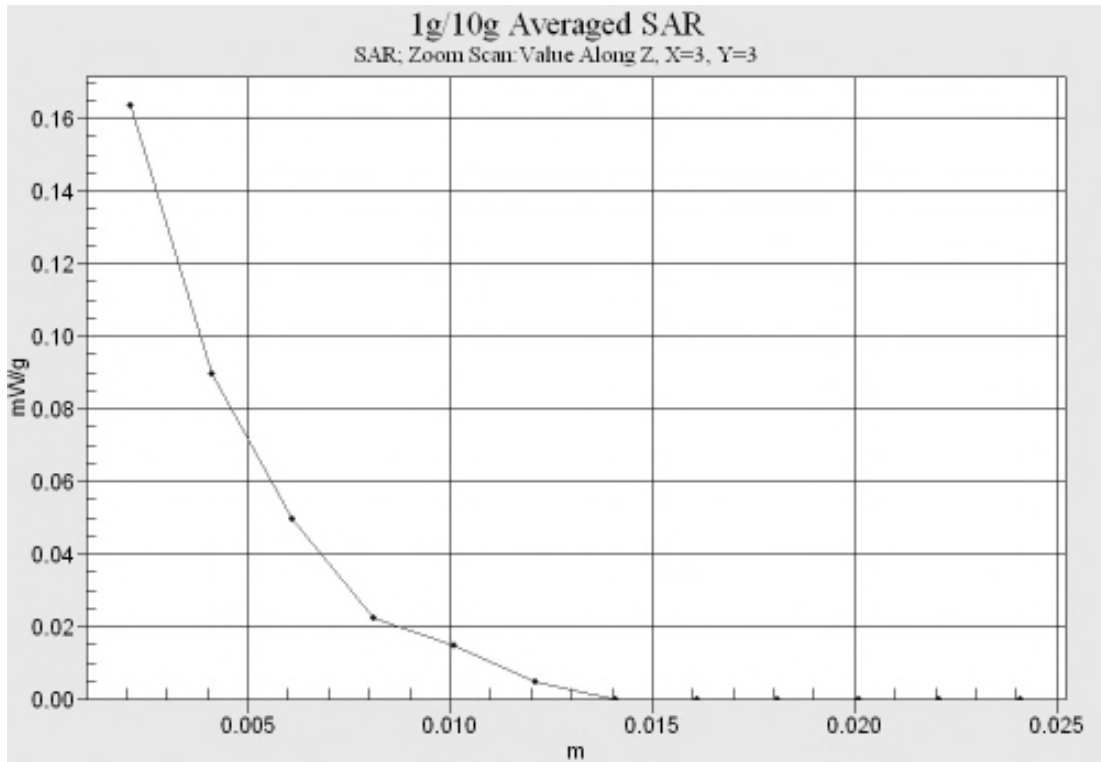
- Probe: EX3DV4 - SN3791; ConvF(4, 4, 4); Calibrated: 2012-05-23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn534; Calibrated: 2012-09-06
- Phantom: SAM MIC #2000-93 with CRP_Right; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

5.2GHz_Left Edge_gep 5mm_6Mbps_CH48/Area Scan (10x15x1): Measurement
 grid: dx=10mm, dy=10mm
 Maximum value of SAR (interpolated) = 0.182 mW/g

5.2GHz_Left Edge_gep 5mm_6Mbps_CH48/Zoom Scan (7x7x12)/Cube 0:
 Measurement grid: dx=4mm, dy=4mm, dz=2mm
 Reference Value = 3.91 V/m; Power Drift = -0.050 dB
 Peak SAR (extrapolated) = 0.299 W/kg
 SAR(1 g) = 0.084 mW/g; SAR(10 g) = 0.026 mW/g
 Maximum value of SAR (measured) = 0.163 mW/g



Z-Scan



Date: 2013-01-24

Test Laboratory: SGS Korea (Gunpo Laboratory)
 File Name: 5.2GHz_Rear_6Mbps_CH48.da4

Ambient Temp : 23.8 °C Tissue Temp : 22.9 °C

DUT: NX300; Type: Digital Camera; Serial: NX300PV-167
Program Name: WLAN_Body

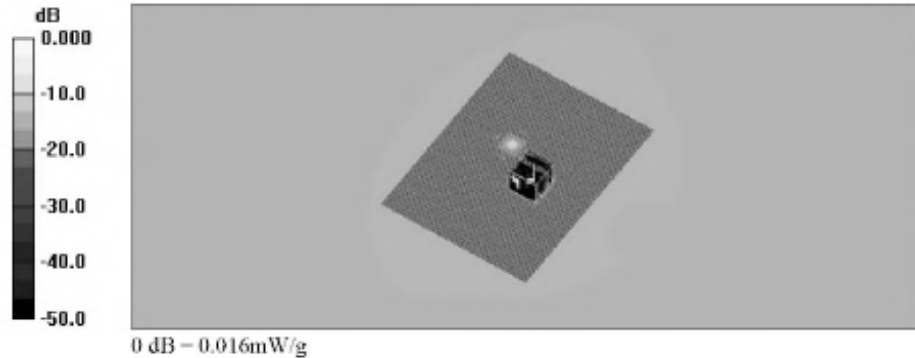
Communication System: WLAN(11a_U-NII Low); Frequency: 5240 MHz;Duty Cycle: 1:1
 Medium parameters used: $f = 5240$ MHz; $\sigma = 5.23$ mho/m; $\epsilon_r = 47.6$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3791; ConvF(4, 4, 4); Calibrated: 2012-05-23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn534; Calibrated: 2012-09-06
- Phantom: SAM MIC #2000-93 with CRP_Right; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

5.2GHz_Rear_6Mbps_CH48_gep 5mm/Area Scan (131x171x1): Measurement grid:
 dx=10mm, dy=10mm
 Maximum value of SAR (interpolated) = 0.014 mW/g

5.2GHz_Rear_6Mbps_CH48_gep 5mm/Zoom Scan (7x7x12)/Cube 0: Measurement
 grid: dx=4mm, dy=4mm, dz=2mm
 Reference Value = 1.42 V/m; Power Drift = 0.189 dB
 Peak SAR (extrapolated) = 0.125 W/kg
 SAR(1 g) = 0.00613 mW/g; SAR(10 g) = 0.000694 mW/g
 Maximum value of SAR (measured) = 0.016 mW/g



Date: 2013-01-24

Test Laboratory: SGS Korea (Gunpo Laboratory)
 File Name: 5.3GHz_Left Edge_6Mbps_CH52.da4

Ambient Temp : 23.8 °C Tissue Temp : 22.9 °C

DUT: NX300; Type: Digital Camera; Serial: NX300PV-167
Program Name: WLAN_Body

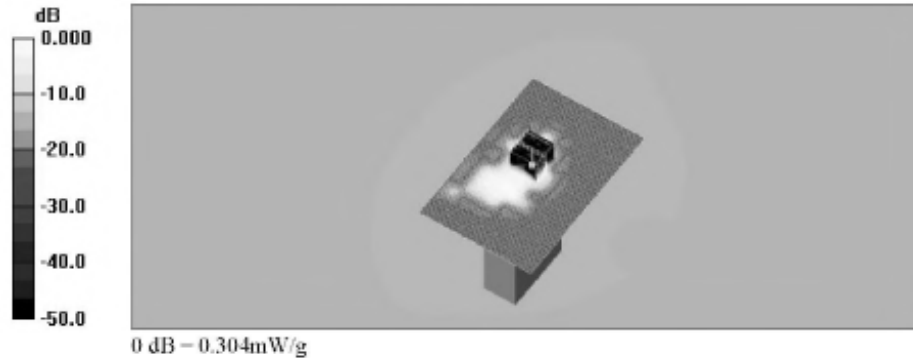
Communication System: WLAN(11a_U-NII Low); Frequency: 5260 MHz;Duty Cycle: 1:1
 Medium parameters used: $f = 5260$ MHz; $\sigma = 5.26$ mho/m; $\epsilon_r = 47.6$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section

DASY4 Configuration:

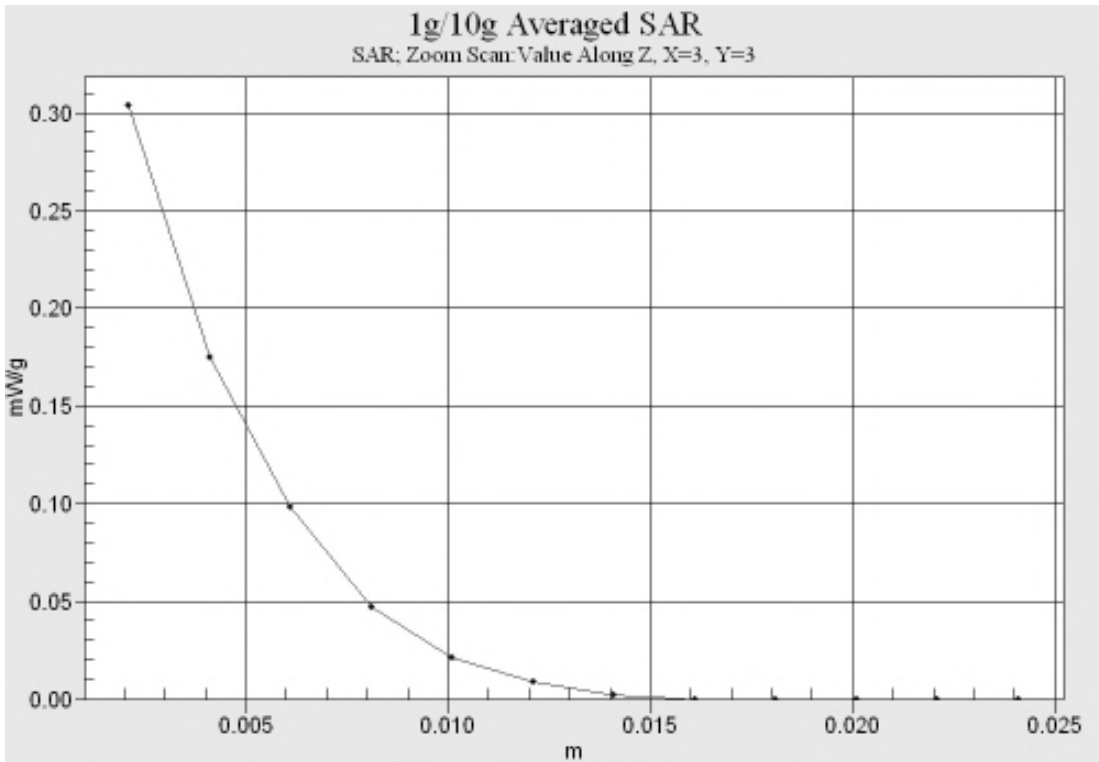
- Probe: EX3DV4 - SN3791; ConvF(3.7, 3.7, 3.7); Calibrated: 2012-05-23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn534; Calibrated: 2012-09-06
- Phantom: SAM MIC #2000-93 with CRP_Right; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

5.3GHz_Left Edge_gep 5mm_6Mbps_CH48/Area Scan (101x151x1): Measurement
 grid: dx=10mm, dy=10mm
 Maximum value of SAR (interpolated) = 0.300 mW/g

5.3GHz_Left Edge_gep 5mm_6Mbps_CH48/Zoom Scan (7x7x12)/Cube 0:
 Measurement grid: dx=4mm, dy=4mm, dz=2mm
 Reference Value = 2.61 V/m; Power Drift = 0.083 dB
 Peak SAR (extrapolated) = 0.556 W/kg
 SAR(1 g) = 0.153 mW/g; SAR(10 g) = 0.044 mW/g
 Maximum value of SAR (measured) = 0.304 mW/g



Z-Scan



Date: 2013-01-24

Test Laboratory: SGS Korea (Gunpo Laboratory)
 File Name: 5.3GHz_Rear_6Mbps_CH52.da4

Ambient Temp : 23.8 °C Tissue Temp : 22.9 °C

DUT: NX300; Type: Digital Camera; Serial: NX300PV-167
Program Name: WLAN_Body

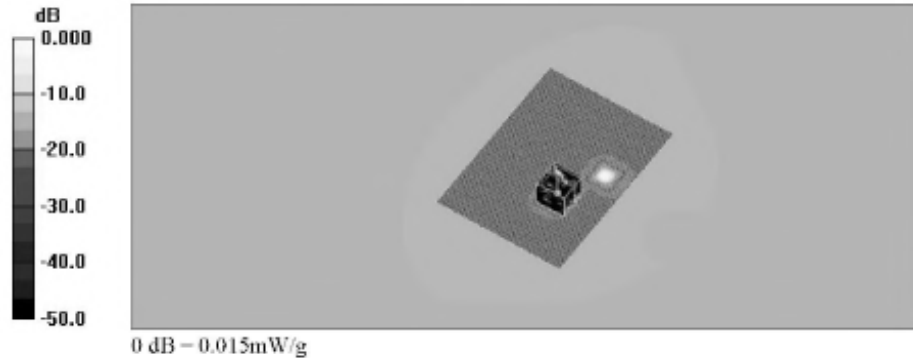
Communication System: WLAN(11a_U-NII Low); Frequency: 5260 MHz;Duty Cycle: 1:1
 Medium parameters used: $f = 5260$ MHz; $\sigma = 5.26$ mho/m; $\epsilon_r = 47.6$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3791; ConvF(3.7, 3.7, 3.7); Calibrated: 2012-05-23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn534; Calibrated: 2012-09-06
- Phantom: SAM MIC #2000-93 with CRP_Right; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

5.3GHz_Rear_6Mbps_CH52_gep 5mm/Area Scan (11x15x1): Measurement grid:
 dx=10mm, dy=10mm
 Maximum value of SAR (interpolated) = 0.023 mW/g

5.3GHz_Rear_6Mbps_CH52_gep 5mm/Zoom Scan (7x7x12)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
 Reference Value = 1.42 V/m; Power Drift = -0.075 dB
 Peak SAR (extrapolated) = 0.055 W/kg
SAR(1 g) = 0.00224 mW/g; SAR(10 g) = 0.00034 mW/g
 Maximum value of SAR (measured) = 0.015 mW/g



Date: 2013-01-25

Test Laboratory: SGS Korea (Gunpo Laboratory)
 File Name: 5.5GHz_Left Edge_6Mbps_CH112.da4

Ambient Temp : 23.4 °C Tissue Temp : 22.4 °C

DUT: NX300; Type: Digital Camera; Serial: NX300PV-167
Program Name: WLAN_Body

Communication System: WLAN(11a_H or CEPT); Frequency: 5560 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 5560$ MHz; $\sigma = 5.59$ mho/m; $\epsilon_r = 48.2$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section

DASY4 Configuration:

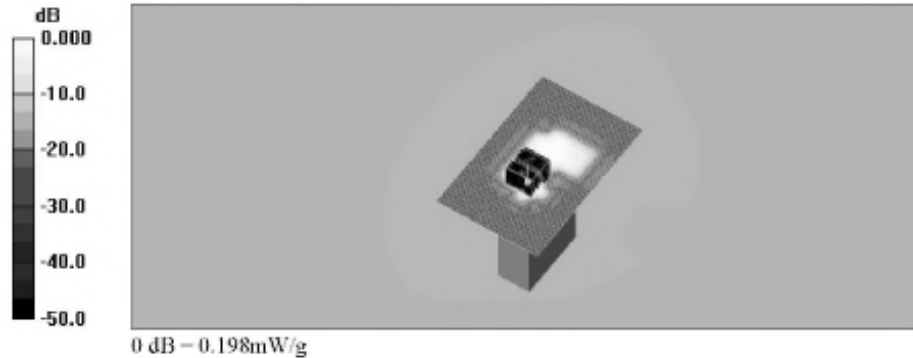
- Probe: EX3DV4 - SN3791; ConvF(3.31, 3.31, 3.31); Calibrated: 2012-05-23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn534; Calibrated: 2012-09-06
- Phantom: SAM MIC #2000-93 with CRP_Right; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

5.5GHz_Left Edge_6Mbps_CH112/Area Scan (91x141x1): Measurement grid: $dx=10$ mm,
 $dy=10$ mm

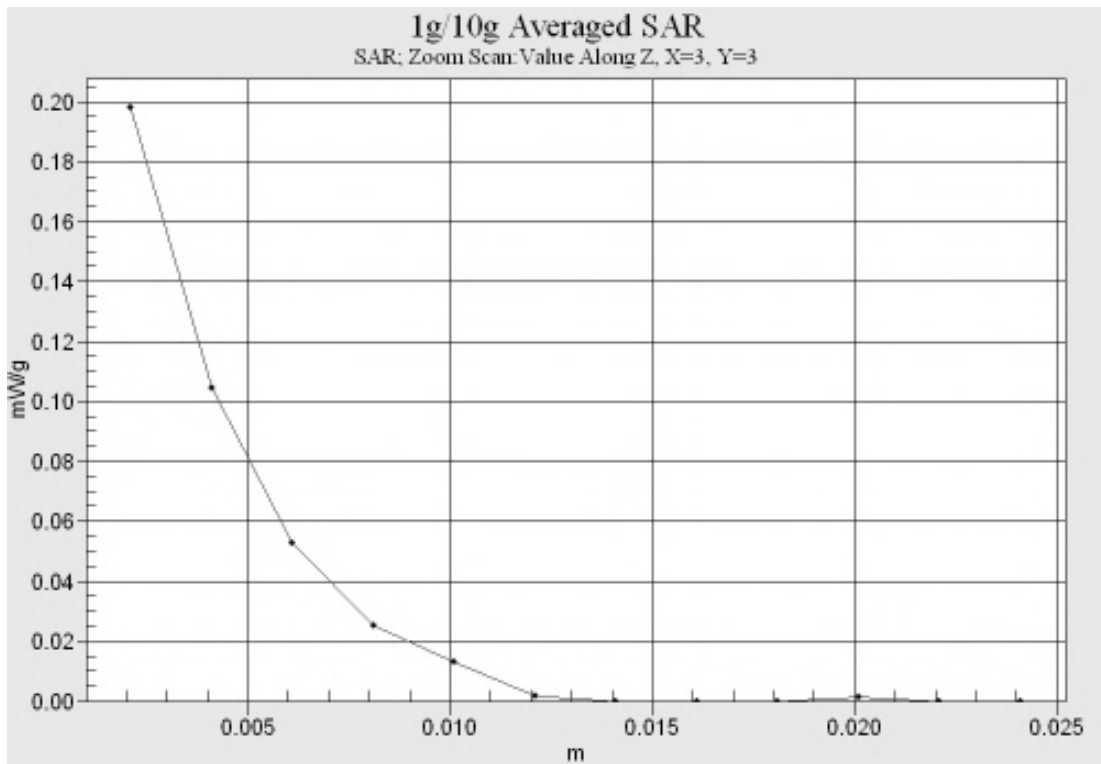
Maximum value of SAR (interpolated) = 0.256 mW/g

5.5GHz_Left Edge_6Mbps_CH112/Zoom Scan (7x7x12)/Cube 0: Measurement grid:

$dx=4$ mm, $dy=4$ mm, $dz=2$ mm
 Reference Value = 2.29 V/m; Power Drift = -0.121 dB
 Peak SAR (extrapolated) = 0.334 W/kg
SAR(1 g) = 0.087 mW/g; SAR(10 g) = 0.024 mW/g
 Maximum value of SAR (measured) = 0.198 mW/g



Z-Scan



Date: 2013-01-25

Test Laboratory: SGS Korea (Gunpo Laboratory)
 File Name: 5.5GHz_Rear_6Mbps_CH112.da4

Ambient Temp : 23.4 °C Tissue Temp : 22.4 °C

DUT: NX300; Type: Digital Camera; Serial: NX300PV-167
Program Name: WLAN_Body

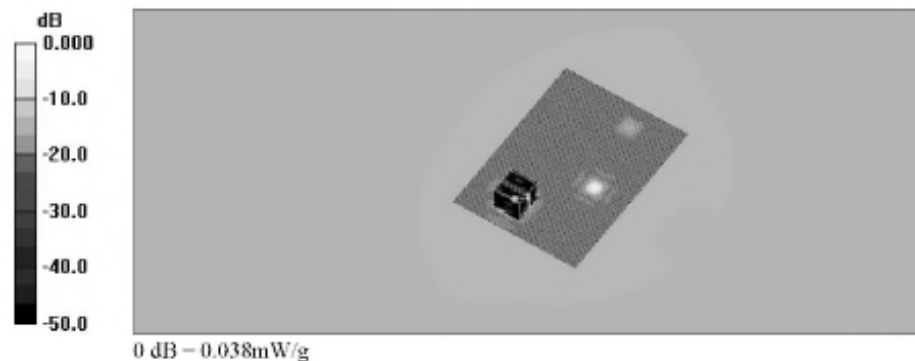
Communication System: WLAN(11a_H or CEPT); Frequency: 5560 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 5560$ MHz; $\sigma = 5.61$ mho/m; $\epsilon_r = 47.6$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3791; ConvF(3.31, 3.31, 3.31); Calibrated: 2012-05-23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn534; Calibrated: 2012-09-06
- Phantom: SAM MIC #2000-93 with CRP_Right; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

5.5GHz_Rear_6Mbps_CH112_gep 5mm/Area Scan (11x15x1): Measurement grid:
 $dx=10$ mm, $dy=10$ mm
 Maximum value of SAR (interpolated) = 0.056 mW/g

5.5GHz_Rear_6Mbps_CH112_gep 5mm/Zoom Scan (7x7x12)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=2$ mm
 Reference Value = 0.000 V/m; Power Drift = 0.000 dB
 Peak SAR (extrapolated) = 0.170 W/kg
 $SAR(1\text{ g}) = 0.015$ mW/g; $SAR(10\text{ g}) = 0.00387$ mW/g
 Maximum value of SAR (measured) = 0.038 mW/g



Date: 2013-01-25

Test Laboratory: SGS Korea (Gunpo Laboratory)
 File Name: 5.8GHz_Left Edge_6Mbps_CH157.da4

Ambient Temp : 23.4 °C Tissue Temp : 22.4 °C

DUT: NX300; Type: Digital Camera; Serial: NX300PV-167
Program Name: WLAN_Body

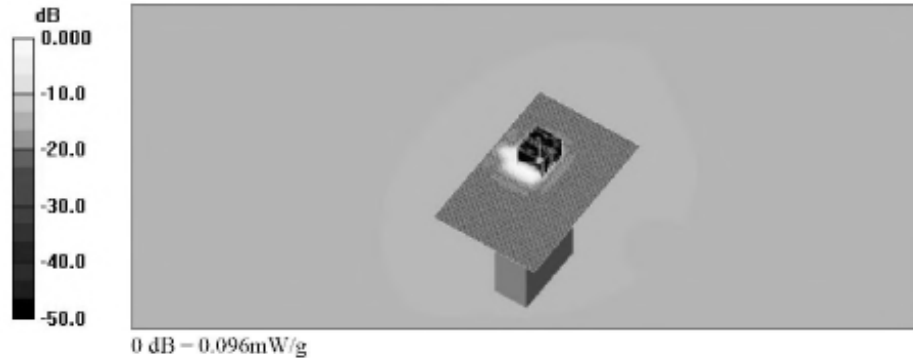
Communication System: WLAN(11a_U-NII Upper); Frequency: 5785 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 5785$ MHz; $\sigma = 5.86$ mho/m; $\epsilon_r = 47.8$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section

DASY4 Configuration:

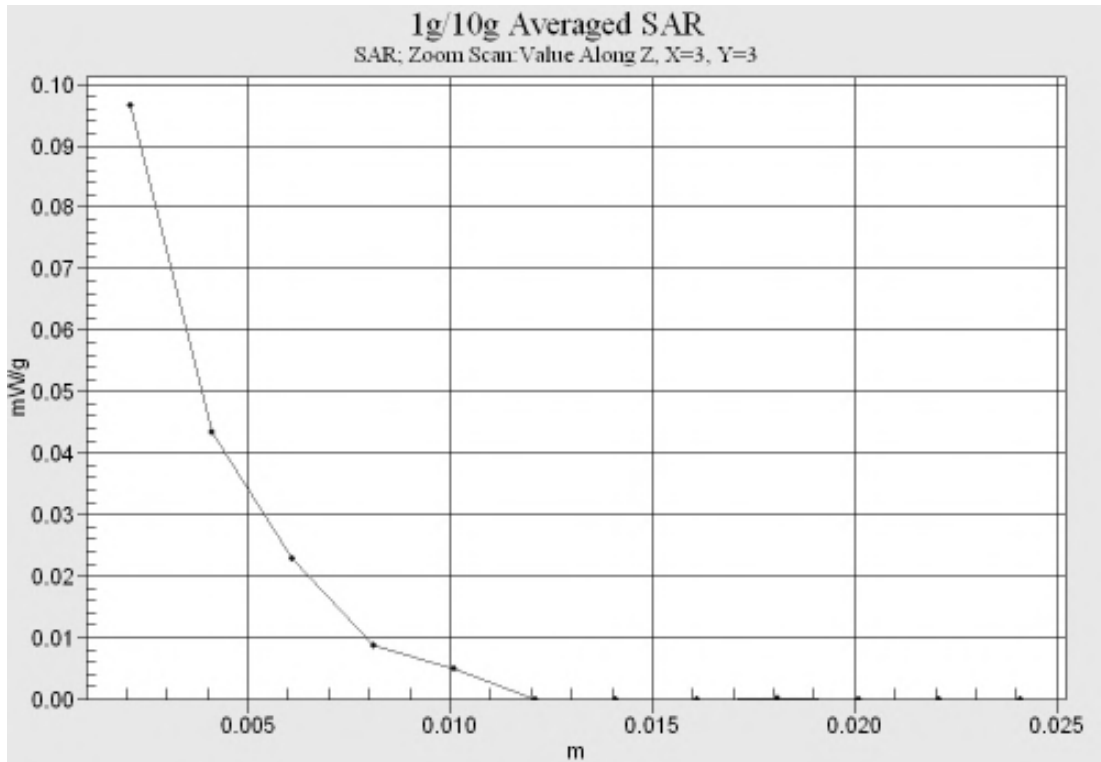
- Probe: EX3DV4 - SN3791; ConvF(3.79, 3.79, 3.79), Calibrated: 2012-05-23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn534; Calibrated: 2012-09-06
- Phantom: SAM MIC #2000-93 with CRP_Right; Type: SAM MIC #2000-93; Serial: TP-1300
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

5.8GHz_Left Edge_6Mbps_CH157/Area Scan (91x141x1): Measurement grid: $dx=10$ mm,
 $dy=10$ mm
 Maximum value of SAR (interpolated) = 0.155 mW/g

5.8GHz_Left Edge_6Mbps_CH157/Zoom Scan (7x7x12)/Cube 0: Measurement grid:
 $dx=4$ mm, $dy=4$ mm, $dz=2$ mm
 Reference Value = 0.748 V/m; Power Drift = 0.191 dB
 Peak SAR (extrapolated) = 0.223 W/kg
SAR(1 g) = 0.046 mW/g; SAR(10 g) = 0.015 mW/g
 Maximum value of SAR (measured) = 0.096 mW/g



Z-Scan



Appendix B

Uncertainty Analysis

Measurement uncertainty for 300 MHz to 3 GHz averaged over 1 gram

a	b	c	d	e = f(d,k)	g	i = cxg/e	k
Uncertainty Component	Section in P1528	Tol (%)	Prob. Dist.	Div.	Ci (1g)	1g ui (%)	Vi (Veff)
Probe calibration	E.2.1	6.0	N	1	1	6.00	∞
Axial isotropy	E.2.2	0.25	R	1.73	1	0.14	∞
hemispherical isotropy	E.2.2	1.3	R	1.73	1	0.75	∞
Boundary effect	E.2.3	0.4	R	1.73	1	0.23	∞
Linearity	E.2.4	0.3	R	1.73	1	0.17	∞
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	0.8	R	1.73	1	0.46	∞
Integration time	E.2.8	2.6	R	1.73	1	1.50	∞
RF ambient Condition -Noise	E.6.1	3.0	R	1.73	1	1.73	∞
RF ambient Condition - reflections	E.6.1	3.0	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	1.0	R	1.73	1	0.58	∞
Test sample positioning	E.4.2	5.84	N	1	1	5.84	9
Device holder uncertainty	E.4.1	3.6	N	1	1	3.60	∞
Output power variation -SAR drift measurement	6.62	5.0	R	1.73	1	2.89	∞
Phantom uncertainty (shape and thickness tolerances)	E.3.1	6.6	R	1.73	1	3.81	∞
Liquid conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	1.85	∞
Liquid conductivity - measurement uncertainty	E.3.2	0.70	N	1	0.64	0.45	5
Liquid permittivity - deviation from target values	E.3.3	5.0	R	1.73	0.6	1.73	∞
Liquid permittivity - measurement uncertainty	E.3.3	0.56	N	1	0.6	0.34	5
Combined standard uncertainty				RSS		11.22	123
Expanded uncertainty (95% CONFIDENCE INTERVAL)				K=2		22.44	

Uncertainty Analysis

Measurement uncertainty for 5000 MHz to 5900 GHz averaged over 1 gram

a Uncertainty Component	b Section in P1528	c Tol (%)	d Prob . Dist.	e = f(d,k) Div.	g Ci (1g)	i =	k Vi (Veff)
						cxg/e	
						1g ui (%)	
Probe calibration	E.2.1	6.55	N	1	1	6.55	∞
Axial isotropy	E.2.2	0.25	R	1.73	0.71	0.10	∞
hemispherical isotropy	E.2.2	1.3	R	1.73	0.71	0.53	∞
Boundary effect	E.2.3	0.4	R	1.73	1	0.23	∞
Linearity	E.2.4	0.3	R	1.73	1	0.17	∞
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	0.8	R	1.73	1	0.46	∞
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	9
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	6.6	R	1.73	1	3.81	∞
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	5
Liquid permittivity - deviation from target values	E.3.3	10	R	1.73	0.6	3.46	∞
Liquid permittivity - measurement uncertainty	E.3.3	1.1	N	1	0.6	0.66	5
Combined standard uncertainty				RSS		11.90	156
Expanded uncertainty (95% CONFIDENCE INTERVAL)				K=2		23.80	

Appendix C

Calibration Certificate

- PROBE

- DAE

- 2450 MHz, 5 GHz DIPOLE

- PROBE Calibration Certificate

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



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

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

Accreditation No.: **SCS 108**

Client **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	MY41496087	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_Dac11)	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

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



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

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

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,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., $\theta = 0$ 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:

- **NORM_{x,y,z}:** Assessed for E-field polarization $\theta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below ConvF).
- **NORM(f)_{x,y,z} = NORM_{x,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.
- **DCP_{x,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
- **A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; VR_{x,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 $f \leq 800$ 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 NORM_{x,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.

EX3DV4 – SN:3791

May 23, 2012

Probe EX3DV4

SN:3791

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

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

EX3DV4- SN:3791

May 23, 2012

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.51	0.56	0.55	$\pm 10.1 \%$
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	$\pm 3.5 \%$
			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 E²-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.

EX3DV4- SN:3791

May 23, 2012

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 %

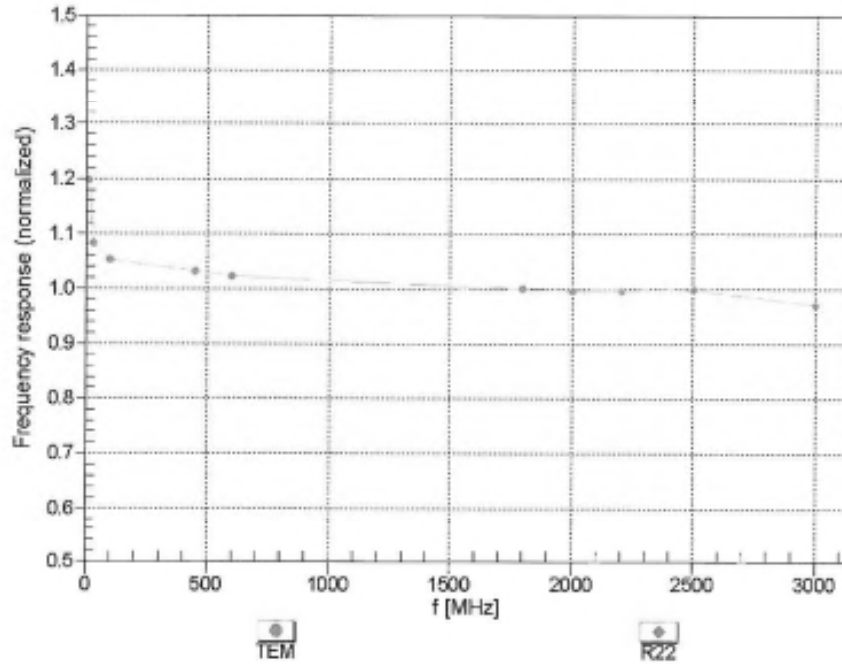
^C Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^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.

EX3DV4-SN:3791

May 23, 2012

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



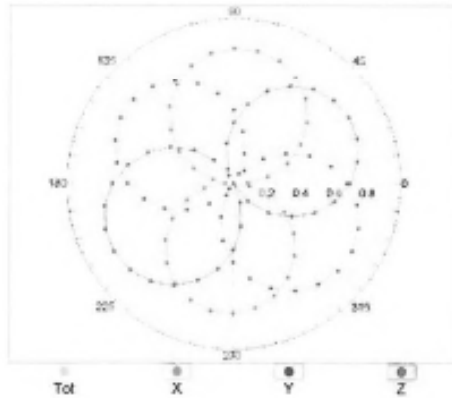
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

EX3DV4-SN:3791

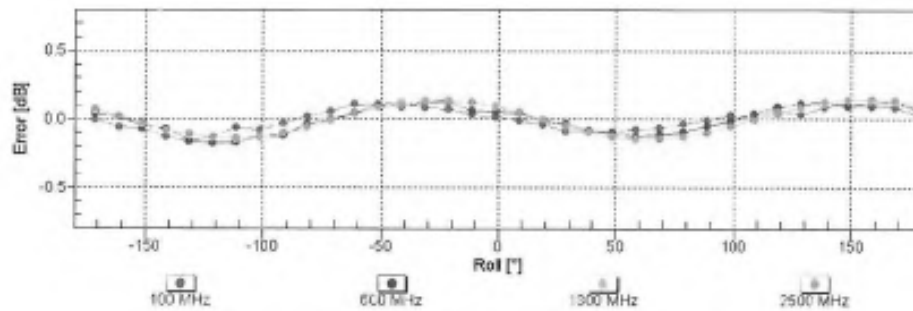
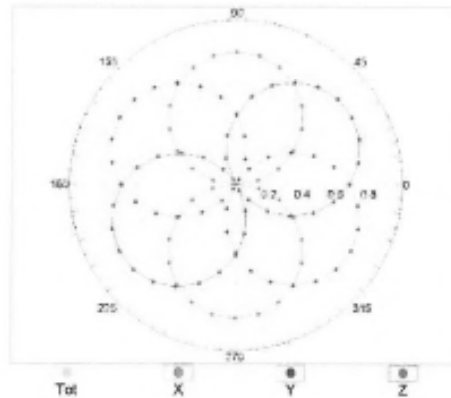
May 23, 2012

Receiving Pattern (ϕ), $\theta = 0^\circ$

f=600 MHz, TEM



f=1800 MHz, R22

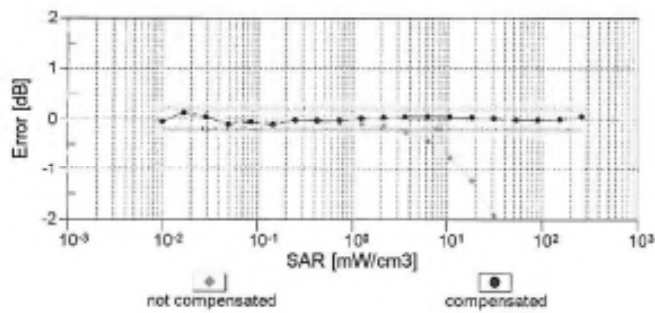
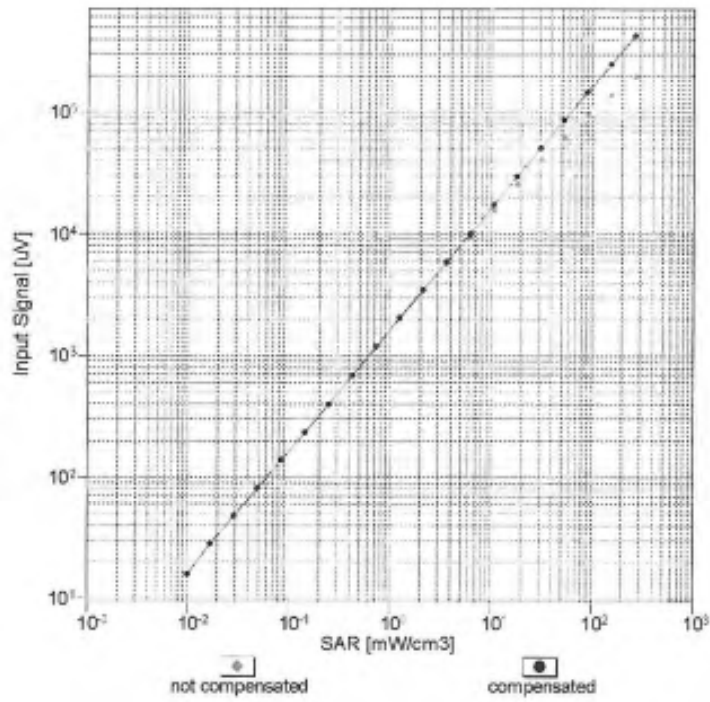


Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ (k=2)

EX3DV4-SN.3791

May 23, 2012

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

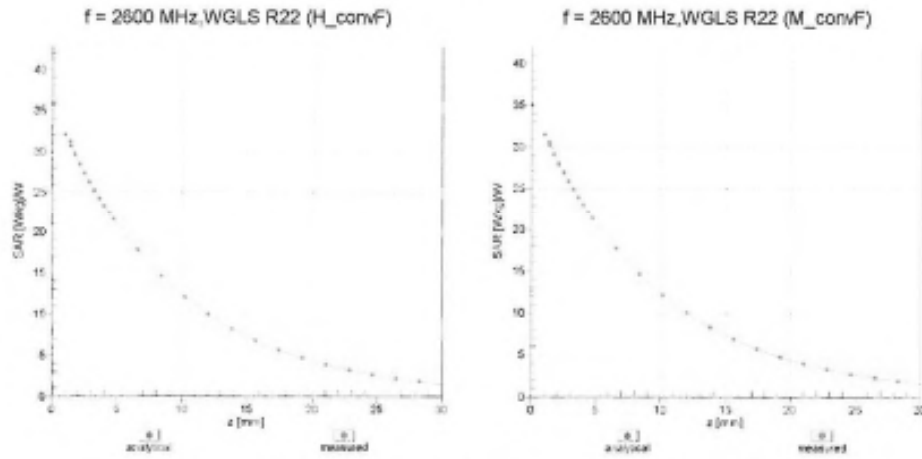


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

EX3DV4-SN:3791

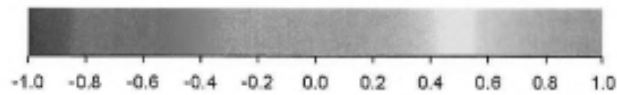
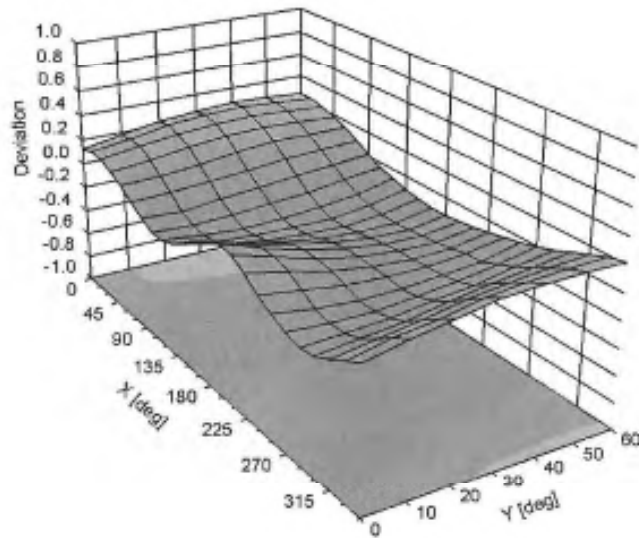
May 23, 2012

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ , θ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ (k=2)

EX3DV4- SN:3791

May 23, 2012

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

Other Probe Parameters

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

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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	GB41293574	29-Mar-12 (No. 217-01505)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01505)	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: 650	10-Jan-12 (No. DAE4-650_Jan12)	Jan-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8548C	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 Kastalli	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 27, 2012

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

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Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,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., $\theta = 0$ 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:

- **NORM_{x,y,z}:** Assessed for E-field polarization $\theta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below ConvF).
- **NORM(f)_{x,y,z} = NORM_{x,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.
- **DCP_{x,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
- **A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; VR_{x,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 $f \leq 800$ 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 NORM_{x,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.

ET3DV6 – SN:1782

April 27, 2012

Probe ET3DV6

SN:1782

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

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

ET3DV6- SN:1782

April 27, 2012

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^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 ^C (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 E²-field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter: uncertainty not required.

^C Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

ET3DV6- SN:1782

April 27, 2012

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^c	Relative Permittivity ^e	Conductivity (S/m) ^e	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.

^e 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

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

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) ^c	Relative Permittivity ^e	Conductivity (Sim) ^e	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 %

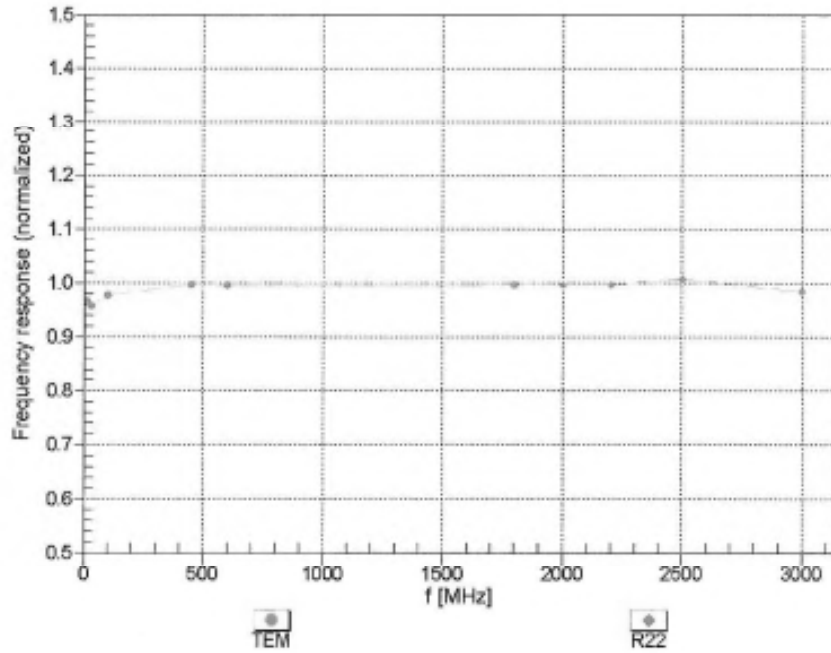
^c Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

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ET3DV6-SN:1782

April 27, 2012

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



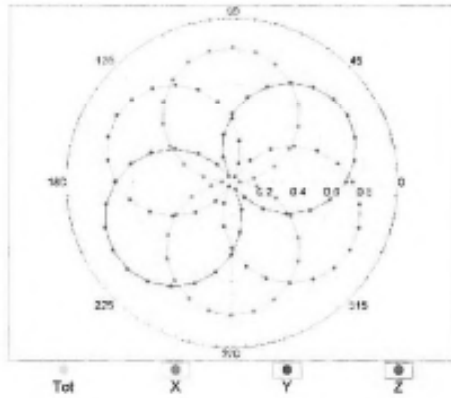
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

ET3DV6-SN:1782

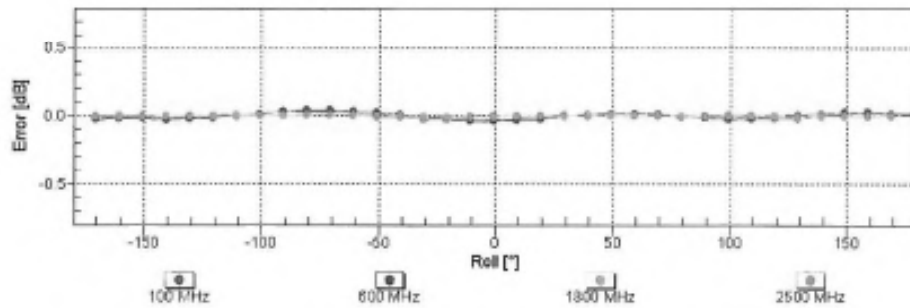
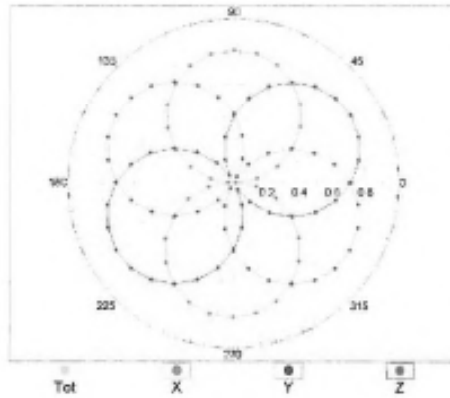
April 27, 2012

Receiving Pattern (ϕ), $\theta = 0^\circ$

f=600 MHz, TEM



f=1800 MHz, R22

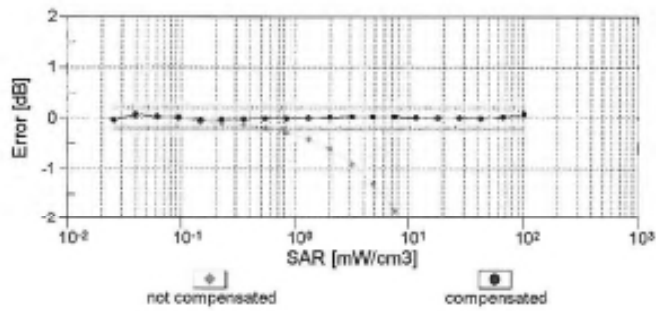
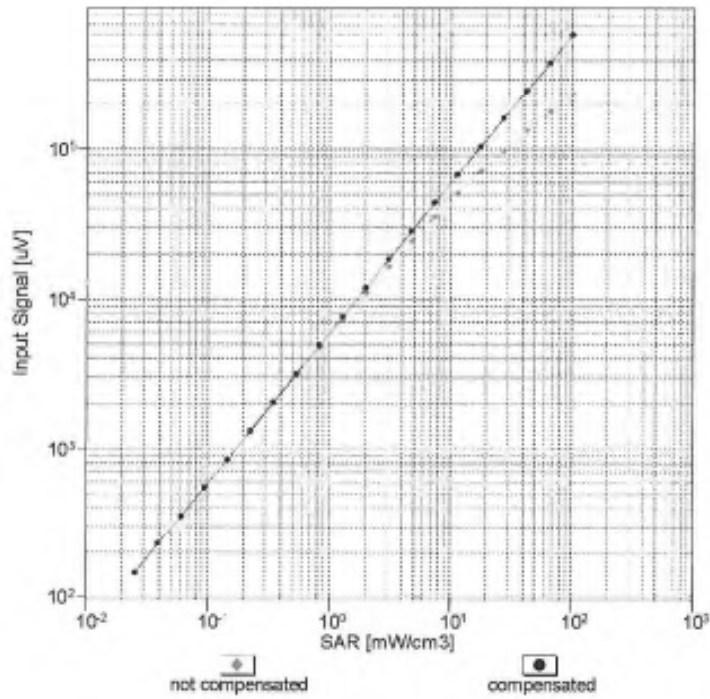


Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ (k=2)

ET3DV6- SN:1782

April 27, 2012

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

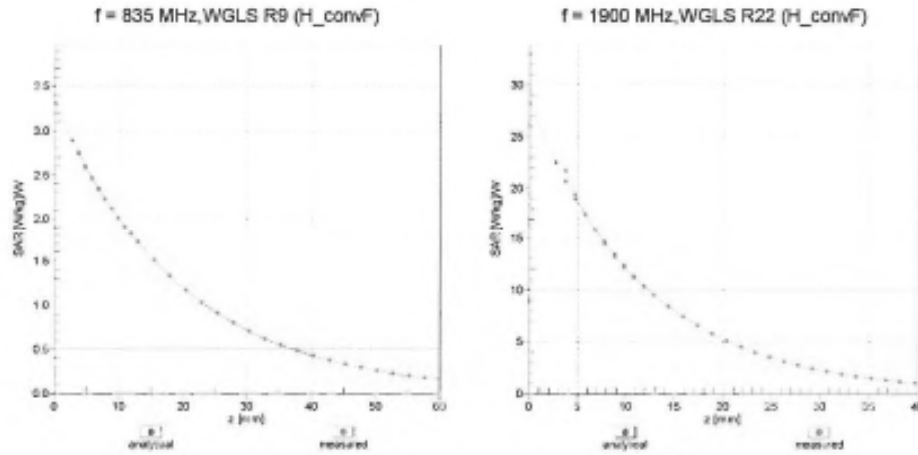


Uncertainty of Linearity Assessment: $\pm 0.6\%$ (k=2)

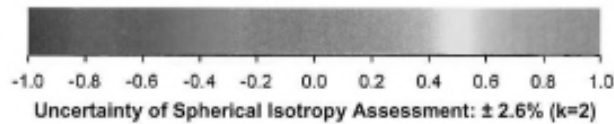
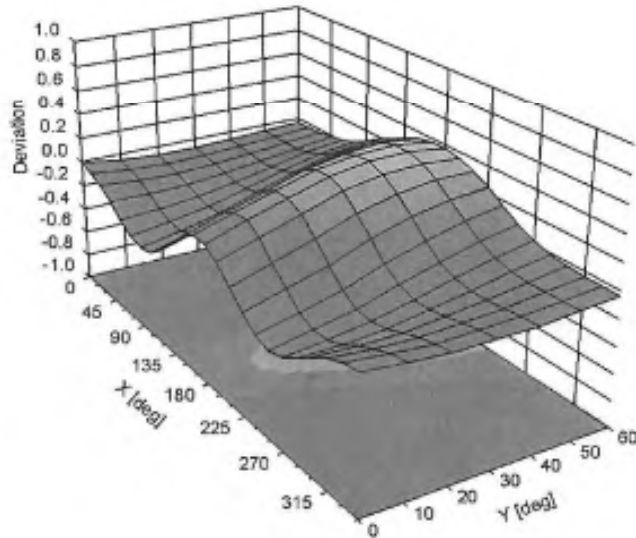
ET3DV6- SN:1782

April 27, 2012

Conversion Factor Assessment



Deviation from Isotropy in Liquid Error (ϕ , θ), $f = 900$ MHz



ET3DV6- SN:1782

April 27, 2012

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

Other Probe Parameters

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

- DAE4 Calibration Certificate

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Accreditation No.: **SCS 108**

Client **LG (Dymstec)**

Certificate No: **DAE4-534_Sep12**

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BJ - SN: 534																		
Calibration procedure(s)	QA CAL-06.v25 Calibration procedure for the data acquisition electronics (DAE)																		
Calibration date:	September 06, 2012																		
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p> <table border="1"> <thead> <tr> <th>Primary Standards</th> <th>ID #</th> <th>Cal Date (Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Keithley Multimeter Type 2001</td> <td>SN: 0810278</td> <td>28-Sep-11 (No:11450)</td> <td>Sep-12</td> </tr> <tr> <th>Secondary Standards</th> <th>ID #</th> <th>Check Date (in house)</th> <th>Scheduled Check</th> </tr> <tr> <td>Calibrator Box V2.1</td> <td>SE UWS 053 AA 1001</td> <td>05-Jan-12 (in house check)</td> <td>In house check: Jan-13</td> </tr> </tbody> </table>				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
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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																
Calibrated by:	Name Dominique Steffen	Function Technician	Signature 																
Approved by:	Fin Bomholt	R&D Director																	
			Issued: September 6, 2012																
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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 = 6.1 μ V, 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	404.398 \pm 0.1% (k=2)	403.551 \pm 0.1% (k=2)	403.432 \pm 0.1% (k=2)
Low Range	3.97473 \pm 0.7% (k=2)	3.95424 \pm 0.7% (k=2)	4.00654 \pm 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	50 $^{\circ}$ \pm 1 $^{\circ}$
---	----------------------------------

Appendix

1. DC Voltage Linearity

High Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	199993.89	-2.83	-0.00
Channel X + Input	20000.82	1.15	0.01
Channel X - Input	-19998.97	2.74	-0.01
Channel Y + Input	199993.92	-2.93	-0.00
Channel Y + Input	19998.59	-1.09	-0.01
Channel Y - Input	-20000.75	1.03	-0.01
Channel Z + Input	199995.20	-1.50	-0.00
Channel Z + Input	19997.49	-2.10	-0.01
Channel Z - Input	-20001.54	0.31	-0.00

Low Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	1999.74	-0.17	-0.01
Channel X + Input	200.36	-0.01	-0.01
Channel X - Input	-199.39	0.16	-0.08
Channel Y + Input	1999.70	-0.16	-0.01
Channel Y + Input	199.88	-0.40	-0.20
Channel Y - Input	-199.47	0.13	-0.06
Channel Z + Input	1999.85	-0.01	-0.00
Channel Z + Input	199.35	-0.94	-0.47
Channel Z - Input	-200.76	-1.16	0.58

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	-12.43	-13.96
	-200	15.33	13.20
Channel Y	200	4.63	4.13
	-200	-4.89	-5.32
Channel Z	200	-1.29	-1.17
	-200	-0.63	-0.78

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	-	2.06	-4.50
Channel Y	200	8.06	-	1.51
Channel Z	200	9.22	6.26	-

4. AD-Converter Values with inputs shorted

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

	High Range (LSB)	Low Range (LSB)
Channel X	16116	15808
Channel Y	15813	15945
Channel Z	15935	16059

5. Input Offset Measurement

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

Input 10M Ω

	Average (μ V)	min. Offset (μ V)	max. Offset (μ V)	Std. Deviation (μ V)
Channel X	0.82	0.08	1.90	0.30
Channel Y	-0.84	-2.48	-0.16	0.32
Channel Z	-1.55	-2.53	-0.72	0.33

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

- 2450 MHz 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 B461A	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 B461A	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

Calibrated by: **Claudio Leubler** Laboratory Technician

Approved by: **Katja Pokovic** Technical Manager

Issued: May 17, 2012

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

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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	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 $\mu\Omega$
Return Loss	- 26.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.9 Ω + 5.1 $\mu\Omega$
Return Loss	- 25.0 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; $\sigma = 1.85$ mho/m; $\epsilon_r = 40.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (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:

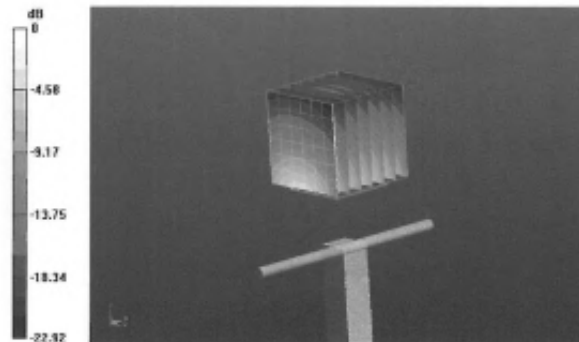
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.190 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 27.316 mW/g

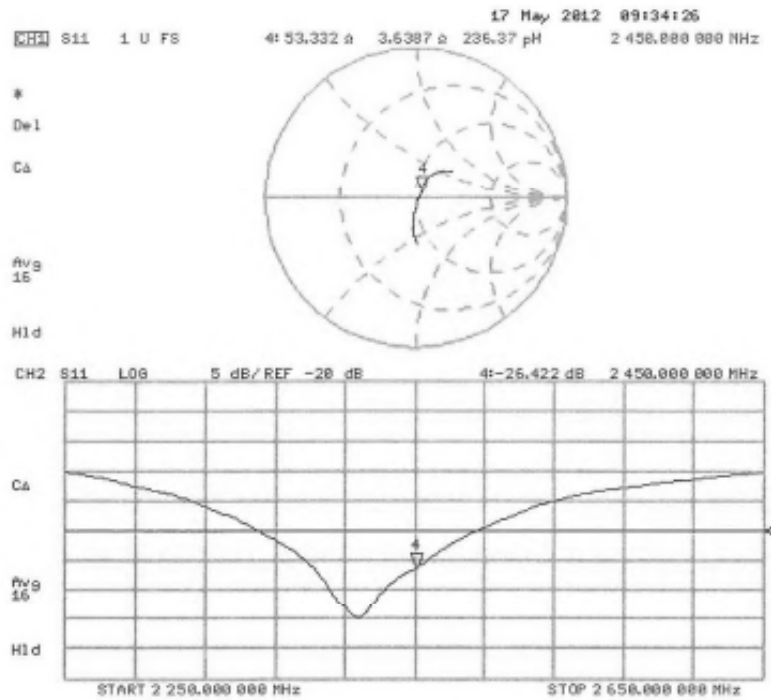
SAR(1 g) = 13.3 mW/g; SAR(10 g) = 6.19 mW/g

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

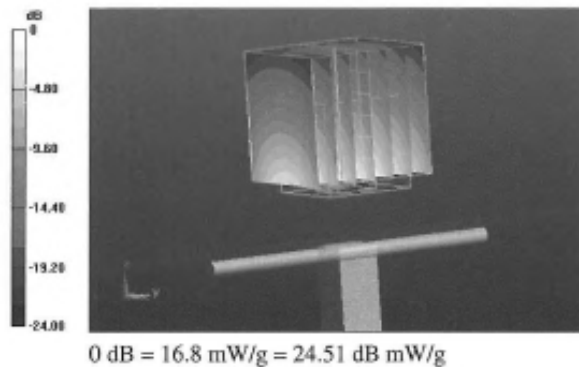
Communication System: CW; Frequency: 2450 MHz
 Medium parameters used: $f = 2450$ MHz; $\sigma = 1.99$ mho/m; $\epsilon_r = 52.3$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section
 Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

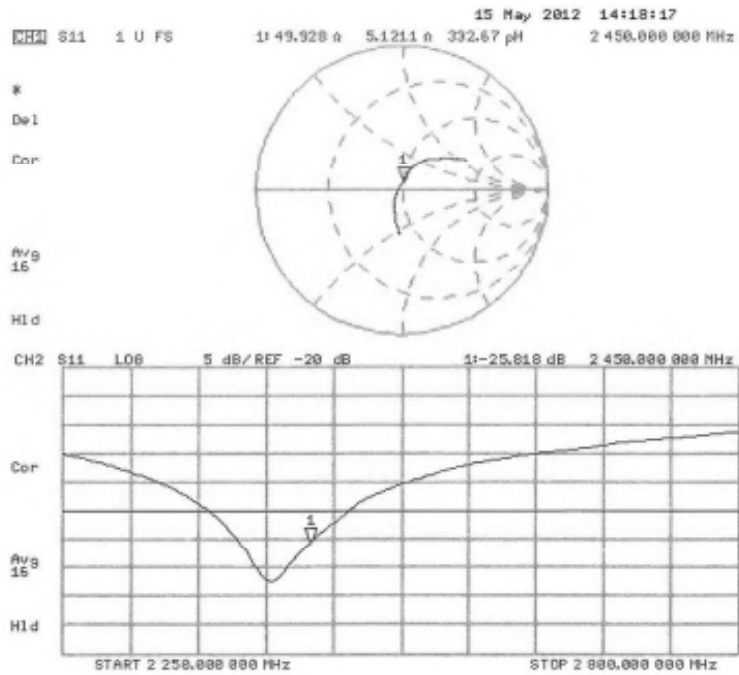
- Probe: ES3DV3 - SN3205; ConvF(4.26, 4.26, 4.26); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mm
 Reference Value = 95.201 V/m; Power 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



Impedance Measurement Plot for Body TSL



5.2 GHz, 5.5 GHz, 5.8 GHz Dipole Calibration Certificate

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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		
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.</p> <p>Calibration Equipment used (M&TE critical for calibration)</p>			
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
Calibrated by:	Name Israe El-Naouq	Function Laboratory Technician	Signature
Approved by:	Name Katja Pokovic	Function Technical Manager	Signature
			Issued: July 3, 2012
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			

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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 j Ω
Return Loss	- 21.3 dB

Antenna Parameters with Head TSL at 5500 MHz

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

Antenna Parameters with Head TSL at 5800 MHz

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

Antenna Parameters with Body TSL at 5200 MHz

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

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	53.5 Ω - 1.8 j Ω
Return Loss	- 29.5 dB

Antenna Parameters with Body TSL at 5800 MHz

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

General Antenna Parameters and Design

Electrical Delay (one direction)	1.204 ns
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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; $\sigma = 4.53$ mho/m; $\epsilon_r = 35.6$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5500$ MHz; $\sigma = 4.82$ mho/m; $\epsilon_r = 35.2$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5800$ MHz; $\sigma = 5.14$ mho/m; $\epsilon_r = 34.8$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section
 Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

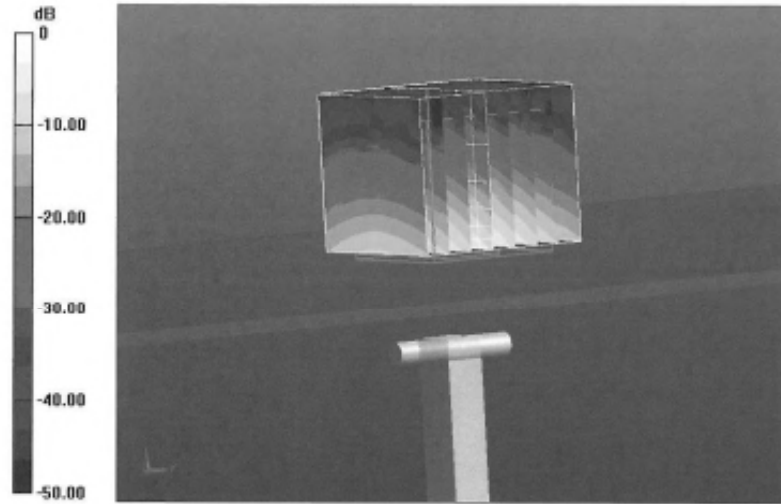
DASY52 Configuration:

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

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

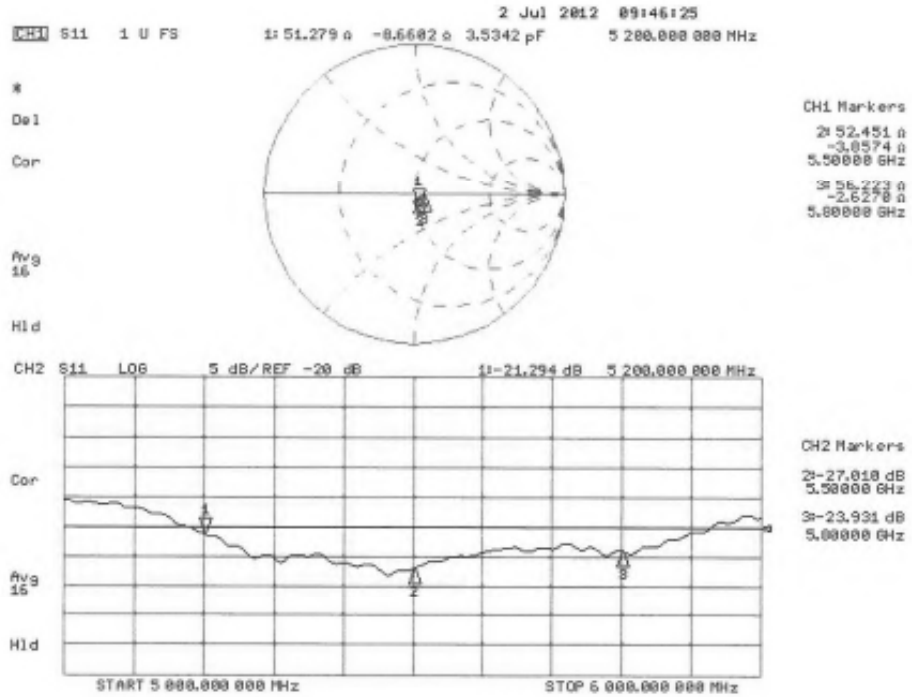
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
 Reference Value = 63.390 V/m; Power Drift = 0.05 dB
 Peak SAR (extrapolated) = 34.226 mW/g
SAR(1 g) = 8.68 mW/g; SAR(10 g) = 2.48 mW/g
 Maximum value of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

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



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; $\sigma = 5.37$ mho/m; $\epsilon_r = 47$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5500$ MHz; $\sigma = 5.76$ mho/m; $\epsilon_r = 46.5$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5800$ MHz; $\sigma = 6.16$ mho/m; $\epsilon_r = 46$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section
 Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

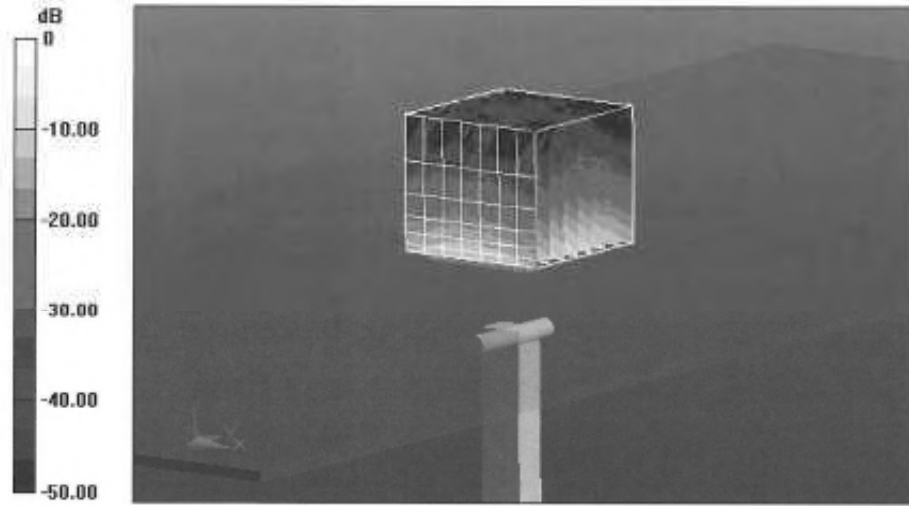
DASY52 Configuration:

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

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

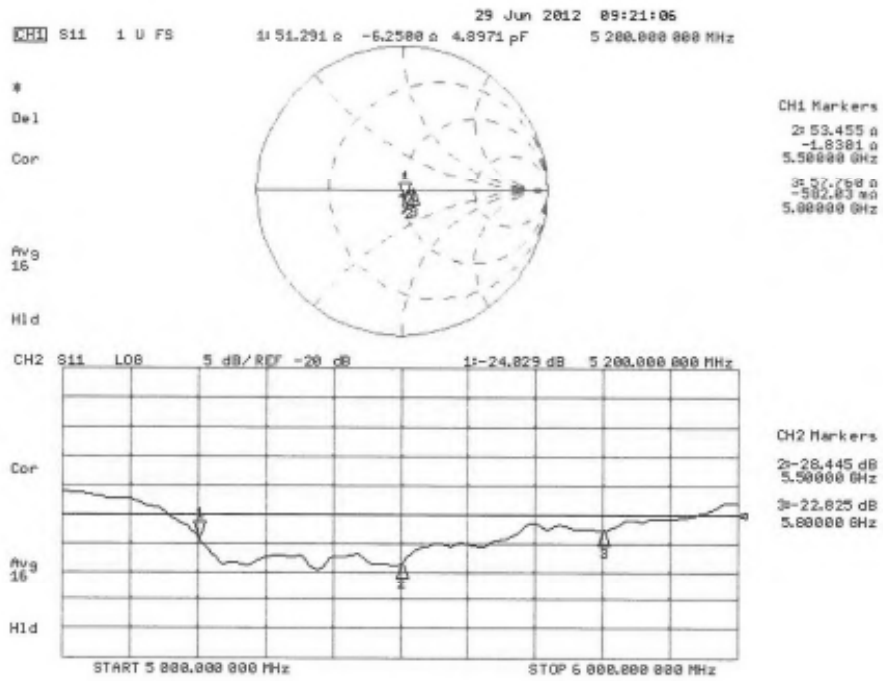
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
 Reference Value = 58.679 V/m; Power Drift = 0.01 dB
 Peak SAR (extrapolated) = 34.309 mW/g
SAR(1 g) = 7.94 mW/g; SAR(10 g) = 2.2 mW/g
 Maximum value of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

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



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

Impedance Measurement Plot for Body TSL



-THE END-