SAR TEST REPORT

Equipment Under Test	:	Intel Centrino Advanced-N6230, 802.11ABGN+BT Half Minicard
Model No.	:	62230ANHMW
Applicant	:	Samsung Electronics Co., Ltd.
Address of Applicant	:	416, Maetan-dong, Yeongtong-gu, Suwon-city, Gyeonggi-do, Korea
FCC ID	:	A3L62230ANH
IC ID	:	649E-62230ANH
Device Category	:	Portable Device
Exposure Category	:	General Population / Uncontrolled Exposure
Date of Receipt	:	2012-01-11
Date of Test(s)	:	2012-01-19 ~ 2012-01-26
Date of Issue	:	2012-01-31
Max. SAR	:	0.904 W/kg (WLAN_2.4 GHz), 0.478 W/kg (WLAN_5.2 GHz) 0.446 W/kg (WLAN_5.3 GHz), 0.669 W/kg (WLAN_5.5 GHz) 0.701 W/kg (WLAN_5.8 GHz)

Standards:

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

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

Remarks:

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

Tested by	: **Robin Jung**	Robin	**2012-01-31**
Approved by	: **Charles Kim**	C. K. Kim	**2012-01-31**

Contents

1. General Information

1.1 Testing Laboratory

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FAX : +82 +31 427 2371
Homepage : www.kr.sgs.com/ee

1.2 Details of Applicant

Applicant : Samsung Electronics Co., Ltd.
Address : 416, Maetan-dong, Yeongtong-gu, Suwon-city, Gyeonggi-do, Korea
Contact : Mr. John Lee
Email : johnlee@samsung.com
Phone No. : 82-31-277-4784

1.3 Version of Report

Version Number	Date	Revision
00	2012-01-31	Initial issue

1.4 Description of EUT(s)

EUT Type	Intel Centrino Advanced-N6230, 802.11ABGN+BT Half Minicard
Model	62230ANHMW
FCC ID	A3L62230ANH
IC ID	649E-62230ANH
Serial Number	HPKQ93GBC00087J
Mode of Operation	WLAN
Duty Cycle	1(WLAN)
Body worn Accessory	None
Tx Frequency Range	2412 ㎒~ 2462 ㎒ (WLAN_11b/g/n) 5180 ㎒ ~ 5240 ㎒, 5260 ㎒ ~ 5320 ㎒ (WLAN_11a/n) 5500 ㎒ ~ 5700 ㎒, 5745 ㎒ ~ 5825 ㎒ (WLAN_11a/n)
Conducted Max Power	16.5 ㏈m (WLAN_2.4 ㎓), 16.1 ㏈m (WLAN_5.2 ㎓) 16.5 ㏈m (WLAN_5.3 ㎓), 16.5 ㏈m (WLAN_5.5 ㎓) 16.7 ㏈m (WLAN_5.8 ㎓)

1.5 Test Environment

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

1.6 Operation Configuration

The device in GSM and WCDMA mode was controlled by using a Communication tester (CMU 200). Communication between the device and the tester was established by air link. The client provided a special driver and test program which can control the frequency and power of the WLAN. Measurements were performed at the lowest, middle and highest channels of the operating band. The EUT was set to maximum power level during all tests and at the beginning of each test the battery was fully charged. The DASY4 system measures power drift during SAR testing by comparing e-field in the same location at the beginning and at the end of measurement.

1.7 Host PC Information

Model Name	62230ANHMW
Serial No.	HPKQ93GBC00087J
Manufacturer	Samsung Electronics Co., Ltd.

1.8 EVALUATION PROCEDURES

- Power Reference Measurement Procedures

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

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- 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.

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

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

The maximum search is automatically performed after each area scan measurement. It is based on splines in

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

1.9 The SAR Measurement System

A photograph of the SAR measurement System is given in Fig. a. This SAR Measurement System uses a Computer-controlled 3-D stepper motor system (Speag Dasy 4 professional system). A Model ET3DV6 1782/Ex3DV4 3791 E-field probe is used to determine the internal electric fields. The SAR can be obtained from the equation SAR= σ (|Ei|2)/ ρ where σ and ρ are the conductivity and mass density of the tissue-simulant. The DASY4 system for performing compliance tests consists of the following items:

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

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

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

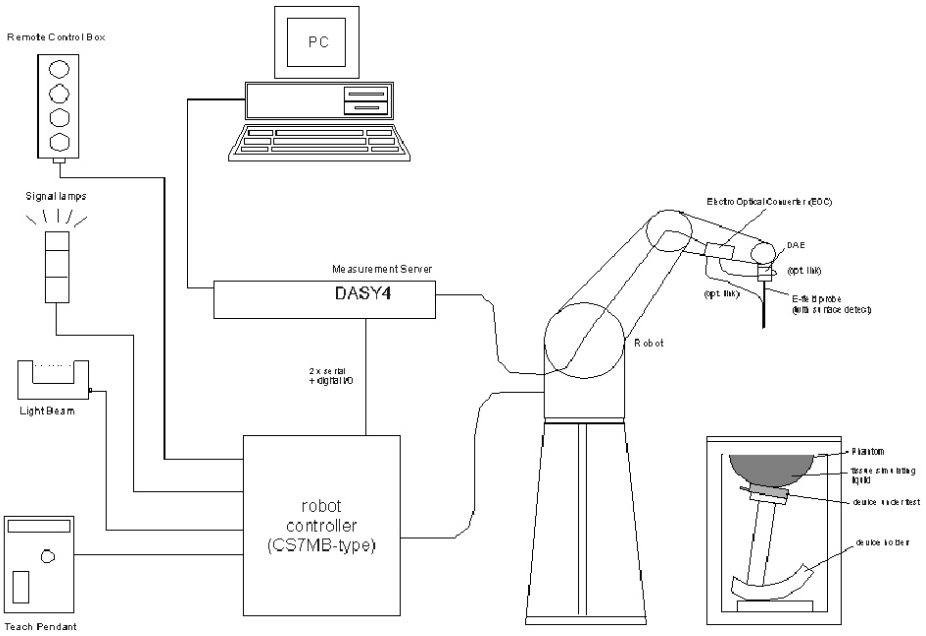


Fig a. The microwave circuit arrangement used for SAR system verification

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

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

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

• A computer operating Windows 2000 or Windows XP.

• DASY4 software.

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

• The SAM twin phantom enabling testing body usage.

• The device holder for flat phantom.

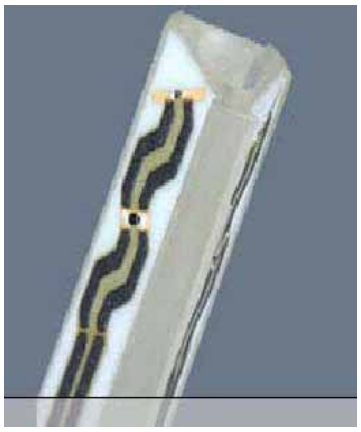
• Tissue simulating liquid mixed according to the given recipes.

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

1.10 System Components

ET3DV6 E-Field Probe

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


ET3DV6 E-Field Probe

EX3DV4 E-Field Probe

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


EX3DV4 E-Field Probe

NOTE:

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

SAM Phantom

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

Shell Thickness: 2.0 mm ± 0.1 mm

Filling Volume: Approx. 25 liters

SAM Phantom

DEVICE HOLDER

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

Device Holder

1.11 SAR System Verification

The microwave circuit arrangement for system verification is sketched in Fig. b. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within +/- 10 % from the target SAR values. These tests were done at 2450 ㎒, 5200 ㎒, 5500 ㎒ and 5800 ㎒. The tests for EUT were conducted within 24 hours after each validation. The obtained results from the system accuracy verification are displayed in the table 1. During the tests, the ambient temperature of the laboratory was in the range (22 ± 2) ° C, the relative humidity was in the range (55 ± 5) % R.H. and the liquid depth above the ear reference points was above 15 cm in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.

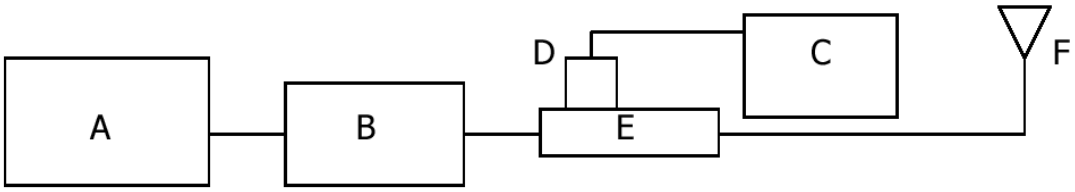


Fig b. The microwave circuit arrangement used for SAR system verification

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

Photo of the dipole Antenna

System Validation Results

Validation Kit	Tissue	Target SAR 1 g from Calibration Certificate (1 W)	Measured SAR 1 g (1 W)	Deviation (%)	Date	Liquid Temp. (°C)
D2450V2 S/N: 734	2450 MHz Body	53.5 W/kg	**54.4** W/kg	**1.68h**	2012-01-19	22.3
D5 GHz V2 S/N: 1023	5200 MHz Body	77.5 W/kg	**74.5** W/kg	**-3.87**	2012-01-20	22.5
D5 GHz V2 S/N: 1023	5500 MHz Body	82.3 W/kg	**80.7** W/kg	**-1.94**	2012-01-25	22.6
D5 GHz V2 S/N: 1023	5800 MHz Body	73.8 W/kg	**77.3** W/kg	**4.74**	2012-01-26	22.8

Table 1. Results system validation

1.12 Tissue Simulant Fluid for the Frequency Band

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

f (㎒)	Tissue type	Limits / Measured	Dielectric Parameters		
			Permittivity	Conductivity	Simulated Tissue Temp(℃)
2450	Body	Measured, 2012-01-19	**51.0**	**2.01**	22.3
		Recommended Limits	52.7	1.95	21.0 ~ 23.0
		Deviation(%)	-3.23	3.08	-
5200	Body	Measured, 2012-01-20	**48.7**	**5.23**	22.5
		Recommended Limits	49.0	5.31	21.0 ~ 23.0
		Deviation(%)	-0.61	-1.51	-
5500	Body	Measured, 2012-01-25	**48.5**	**5.66**	22.6
		Recommended Limits	48.6	5.66	21.0 ~ 23.0
		Deviation(%)	-0.21	0.00	-
5800	Body	Measured, 2012-01-26	**47.9**	**6.27**	22.8
		Recommended Limits	48.2	6.01	21.0 ~ 23.0
		Deviation(%)	-0.62	4.33	-

The composition of the tissue simulating liquid

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

Ingredients (% by weight)	Frequency (㎒)										
	450		835		915		1900		2450		5200-5800
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2	78.66
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04	0.0
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	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	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	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	10.67
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7	0.0
Diethylenglycol monohexylether	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.67

Salt: 99 +% Pure Sodium Chloride Sugar: 98 +% Pure Sucrose
Water: De-ionized, 16 MΩ+ resistivity HEC: Hydroxyethyl Cellulose
DGBE: 99 +% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

1.13 Test Standards and Limits

According to FCC 47CFR §2.1093(d) The limits to be used for evaluation are based generally on criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (‘‘SAR’’) in Section 4.2 of ‘‘IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz,’’ ANSI/IEEE C95.3–2003, Copyright 2003 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in ‘‘Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields,’’ NCRP Report No. 86, Section 17.4.5. Copyright NCRP, 1986, Bethesda, Maryland 20814. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards. The criteria to be used are specified in paragraphs (d)(1) and (d)(2) of this section and shall apply for portable devices transmitting in the frequency range from 100 kHz to 6 GHz. Portable devices that transmit at frequencies above 6 GHz are to be evaluated in terms of the MPE limits specified in § 1.1310 of this chapter. Measurements and calculations to demonstrate compliance with MPE field strength or power density limits for devices operating above 6 GHz should be made at a minimum distance of 5 cm from the radiating source.

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

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

devices such as cellular telephones will not be sufficient reason to allow these devices to be evaluated subject to limits for occupational/controlled exposure in paragraph (d)(1) of this section.(Table .4)

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

Table .4 RF exposure limits

1.14 Justification for Extended SAR Dipole Calibrations

Usage of SAR dipoles calibrated less than 2 years ago but more than 1 year ago were confirmed in maintaining return loss (< -20 dB, within 20 % of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB publication 450824:

D2450V2_Body (SN : 734)				
Measurement Date	Return Loss (dB)	Δ%	Impedence (Ω)	ΔΩ
2010-05-27	-27.1	-	49.8	-
2011-06-07	-26.2	-3.32	48.3	-3.01

2. Instruments List

Maunfacturer	Device	Type	Serial Number	Due date of Calibration
Stäubli	Robot	RX90BL	F03/5W05A1/A/01	N/A
Schmid& Partner Engineering AG	Dosimetric E-Field Probe	ET3DV6	1782	April 14, 2012
Schmid& Partner Engineering AG	Dosimetric E-Field Probe	EX3DV4	3791	June 21, 2012
Schmid& Partner Engineering AG	2450 ㎒ System Validation Dipole	D2450V2	734	May 27, 2012
Schmid& Partner Engineering AG	2450 ㎒ System Validation Dipole	D5 ㎓ V2	1023	January 19, 2013
Schmid& Partner Engineering AG	Data acquisition Electronics	DAE3	479	August 29, 2012
Schmid& Partner Engineering AG	Software	DASY 4 V4.7	-	N/A
Schmid& Partner Engineering AG	Phantom	SAM Phantom V4.0	TP-1645 TP-1300	N/A
Agilent	Network Analyzer	E5071C	MY46111535	July 5, 2012
Agilent	Dielectric Probe Kit	85070D	2184	N/A
Agilent	Power Meter	E4419B	GB43311126	July 04, 2012
Agilent	Power Sensor	E9300H	MY41495307	September 29, 2012
			MY41495308	September 29, 2012
Agilent	Signal Generator	E4421B	MY43350132	July 05, 2012
Empower RF Systems	Power Amplifier	2001-BBS3Q7ECK	1032 D/C 0336	April 01, 2012
Empower RF Systems	Power Amplifier	2092-BBS5K8CAJ	1010	September 06, 2012
Agilent	Dual Directional Coupler	777D	50128	July 10, 2012
		778D	50454	July 06, 2012
Agilent	Directional RF Bridges	86205A	MY31402302	July 12, 2012
Microlab	LP Filter	LA-60N	N/A	September 29, 2012

3.Summary of Results

3.1 FCC Power Measurement Procedures

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

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

3.2 RF Conducted Average Power

WLAN

2.4 GHz

Mode	Ch. #	Freq. (MHz)	Rate	Original Power [dB m]		Measured Power [dB m]	
				Chain A	Chain B	Chain A	Chain B
802.11b	1	2412	1	16.8		16.5	
	6	2437	1	16.8		16.5	
	11	2462	1	16.8		16.5	
	1	2412	1		16.6		16.4
	6	2437	1		15.0		15.0
	11	2462	1		16.0		15.9
802.11g	1	2412	6	14.1		14.1	
	6	2437	6	16.6		16.3	
	11	2462	6	14.0		14.0	
	1	2412	6		13.9		13.8
	6	2437	6		16.7		16.5
	11	2462	6		13.5		13.5
802.11n HT20	1	2412	HT0	13.1		13.1	
	6	2437	HT0	16.5		16.2	
	11	2462	HT0	12.5		12.4	
	1	2412	HT8		12.5		12.3
	6	2437	HT8		16.6		16.3
	11	2462	HT8		12.4		12.2
	1	2422	HT0	11.6	11.6	11.6	11.6
	6	2437	HT0	13.3	13.0	13.2	13.0
	11	2450	HT0	11.1	10.4	11.1	10.3

Mode	Ch. #	Freq. (MHz)	Rate	Original Power [dB m]		Measured Power [dB m]	
				Chain A	Chain B	Chain A	Chain B
802.11n HT40	3	2422	HT0	10.6		10.3	
	6	2437	HT0	13.6		13.2	
	9	2450	HT0	10.1		10.1	
	3	2422	HT0		9.2		9.1
	6	2437	HT0		12.7		12.6
	9	2450	HT0		10.1		10.0
	3	2422	HT8	7.3	7.0	7.2	7.0
	6	2437	HT8	12.3	12.3	12.1	12.3
	9	2450	HT8	6.5	6.7	6.4	6.7

Note :

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

Please refer to original report (FCC ID: PD962230ANH and PD962230ANHU) for Average Power information as documented in 10/21/2010 original filing.

5.2 GHz

Mode	Ch. #	Freq. (MHz)	Rate	Original Power [dB m]		Measured Power [dB m]	
				Chain A	Chain B	Chain A	Chain B
802.11a	36	5180	6	16.2		16.1	
	40	5200	6	16.2		16.1	
	48	5240	6	15.9		15.8	
	36	5180	6		15.9		15.9
	40	5200	6		15.8		15.8
	48	5240	6		15.7		15.7
802.11n HT20	36	5180	HT0	15.9		15.7	
	40	5200	HT0	16.5		16.3	
	48	5240	HT0	16.4		16.3	
	36	5180	HT0		16.0		15.9
	40	5200	HT0		16.0		15.9
	48	5240	HT0		15.9		15.8
	36	5180	HT8	13.3	13.3	13.3	13.3
	40	5200	HT8	13.2	13.2	13.0	12.9
	48	5240	HT8	13.0	12.9	12.9	12.7
802.11n HT40	38	5190	HT7	12.8		12.8	
	46	5230	HT7	16.4		16.4	
	38	5190	HT7		12.7		12.6
	46	5230	HT7		15.8		15.6
	38	5190	HT8	10.0	10.8	10.0	10.4
	46	5230	HT8	13.4	13.3	13.3	13.3

Note :

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

Please refer to original report (FCC ID: PD962230ANH and PD962230ANHU) for Average Power information as documented in 10/21/2010 original filing.

5.3 GHz

Mode	Ch. #	Freq. (MHz)	Rate	Original Power [dB m]		Measured Power [dB m]	
				Chain A	Chain B	Chain A	Chain B
802.11a	52	5260	6	15.9		15.9	
	60	5300	6	16.3		16.2	
	64	5320	6	16.4		16.3	
	52	5260	6		15.3		15.3
	60	5300	6		15.4		15.3
	64	5320	6		15.9		15.9
802.11n HT20	52	5260	HT0	16.1		16.1	
	60	5300	HT0	16.6		16.5	
	64	5320	HT0	16.6		16.4	
	52	5260	HT0		15.4		15.3
	60	5300	HT0		15.3		15.2
	64	5320	HT0		15.7		15.5
	52	5260	HT8	12.7	12.5	12.7	12.2
	60	5300	HT8	13.2	12.6	13.2	12.3
	64	5320	HT8	12.9	13.1	12.9	13.0
802.11n HT40	54	5270	HT7	16.0		15.7	
	62	5310	HT7	11.5		11.2	
	54	5270	HT7		15.2		15.1
	62	5310	HT7		12.4		12.1
	54	5270	HT8	12.6	12.5	12.5	12.4
	62	5310	HT8	12.4	12.3	12.3	12.3

Note :

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

Please refer to original report (FCC ID: PD962230ANH and PD962230ANHU) for Average Power information as documented in 10/21/2010 original filing.

5.5 GHz

Mode	Ch. #	Freq. (MHz)	Rate	Original Power [dB m]		Measured Power [dB m]	
				Chain A	Chain B	Chain A	Chain B
802.11a Legacy	100	5500	6	16.4		16.2	
	116	5580	6	16.5		16.5	
	140	5700	6	16.5		16.4	
	100	5500	6		15.6		15.4
	116	5580	6		15.7		15.6
	140	5700	6		15.5		15.5
802.11n HT20	100	5500	HT0	16.4		16.4	
	116	5580	HT0	16.4		16.4	
	140	5700	HT0	16.3		16.3	
	100	5500	HT0		15.6		15.3
	116	5580	HT0		15.7		15.6
	140	5700	HT0		15.5		15.5
	100	5500	HT8	12.7	13.2	12.7	13.0
	116	5580	HT8	12.7	13.2	12.7	13.2
	140	5700	HT8	12.4	12.4	12.3	12.3
802.11n HT40	102	5510	HT7	15.5		15.3	
	110	5550	HT7	16.5		16.3	
	134	5670	HT7	16.4		16.3	
	102	5510	HT7		14.8		14.6
	110	5550	HT7		15.8		15.6
	134	5670	HT7		15.6		15.3
	102	5510	HT8	13.1	13.0	12.8	12.7
	110	5550	HT8	13.2	13.2	12.8	12.9
	134	5670	HT8	12.6	12.8	12.5	12.6

Note :

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

Please refer to original report (FCC ID: PD962230ANH and PD962230ANHU) for Average Power information as documented in 10/21/2010 original filing.

5.5 GHz

Mode	Ch. #	Freq. (MHz)	Rate	Original Power [dB m]		Measured Power [dB m]	
				Chain A	Chain B	Chain A	Chain B
802.11a	149	5745	6	16.5		16.5	
	157	5785	6	16.5		16.5	
	165	5825	6	16.5		16.5	
	149	5745	6		16.7		16.7
	157	5785	6		16.7		16.7
	165	5825	6		16.6		16.5
802.11n HT20	149	5745	HT0	16.6		16.4	
	157	5785	HT0	16.5		16.4	
	165	5825	HT0	16.5		16.5	
	149	5745	HT0		16.0		15.9
	157	5785	HT0		15.9		15.7
	165	5825	HT0		15.9		15.7
	149	5745	HT8	13.6	13.5	13.4	13.2
	157	5785	HT8	13.5	13.4	13.3	13.0
	165	5825	HT8	13.3	13.7	13.3	13.3
802.11n HT40	151	5755	HT7	16.5		16.5	
	159	5795	HT7	16.5		16.5	
	151	5755	HT7		16.6		16.3
	159	5795	HT7		16.6		16.2
	151	5755	HT8	13.5	13.5	13.4	13.4
	159	5795	HT8	13.3	13.4	13.3	13.2

Note :

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

Please refer to original report (FCC ID: PD962230ANH and PD962230ANHU) for Average Power information as documented in 10/21/2010 original filing.

3.3 SAR Test Configuration

Notebook Testing for SAR

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

SAR Testing for Notebook per KDB 447498 & KDB 616217

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

SAR is required for each antenna located within 5 cm of the edge closet to the user for the applicable display orientation. For antenna(s) located ≥ 5 cm from this edge, the test reduction and exclusion procedures for laptop computers in KDB 616217 are applied.

IEEE 802.11 Transmitters

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

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

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

According to KDB 616217, the WWAN and WLAN antenna are required to be tested for SAR as below.

Mode	Front Screen	Back Screen	Left Screen	Right Screen	Top Screen	Base
WLAN	X	O	X	X	X	O

<The Distance information of Antenna to Edges of EUT>

3.4 SAR Data Summary

Ambient Temperature (°C)	22.3
Liquid Temperature (°C)	22.3
Date	2012-01-19

2.4 GHz Body Test

1. Base

Mode	Ch. #	Freq. (MHz)	Antenna (Chain)	Avg. output Power (dB m)	Test Results (W/kg)	
					1g-SAR	10g-SAR
802.11b	1	2412	Main	**16.8**	0.904	0.368
	6	2437	Main	**16.8**	0.873	0.355
	11	2462	Main	**16.8**	0.880	0.351
	1	2412	AUX	**16.6**	0.713	0.290
	6	2437	AUX	15.0		
	11	2462	AUX	16.0		
802.11n (HT20)	1	2412	Main &AUX			
	6	2437	Main &AUX	**13.2 & 13.0**	0.445	0.186
	11	2462	Main &AUX			
802.11n (HT40)	3	2422	Main &AUX			
	6	2437	Main &AUX	**12.1 & 12.3**	0.310	0.131
	9	2450	Main &AUX			

2. Back Screen

Mode	Ch. #	Freq. (MHz)	Antenna (Chain)	Avg. output Power (dB m)	Test Results (W/kg)	
					1g-SAR	10g-SAR
802.11b	1	2412	Main	**16.8**	0.015	0.00727
	6	2437	Main	16.8		
	11	2462	Main	16.8		
802.11n (HT20)	1	2412	Main &AUX			
	6	2437	Main &AUX	**13.2 & 13.0**	0.00868	0.00301
	11	2462	Main &AUX			

<Note>

1. The test data reported are the worst-case SAR value with the position set in a typical configuration.
2. All modes of operation were investigated, and worst-case results are reported.
3. Liquid tissue depth was at least 15 cm.
4. The distance from EUT to flat phantom for testing Back position is 15 mm and Base position is no gap.
5. According to KDB 248227, SAR is not required for 802.11g/n HT20/HT40 single chain channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels
6. Other position was not tested since the antenna distance to edge was greater than 5 cm per KDB616217.
7. The modes with highest output power channel were chosen for the conducted output power.
8. Base position and Back screen Position tested according to RSS-102 (Issue 4) standard.

Ambient Temperature (°C)	22.5
Liquid Temperature (°C)	22.5
Date	2012-01-20

5.2 GHz Body Test

1. Base

Mode	Ch. #	Freq. (MHz)	Antenna (Chain)	Avg. output Power (dB m)	Test Results (W/kg)	
					1g-SAR	10g-SAR
802.11n (HT20)	36	5180	Main	15.9		
	40	5200	Main	**16.5**	0.348	0.096
	48	5240	Main	16.4		
	36	5180	AUX	16.0		
	40	5200	AUX	**16.0**	0.478	0.146
	48	5240	AUX	15.9		
802.11n (HT20)	36	5180	Main &AUX	**13.3 & 13.3**	0.192	0.062
	40	5200	Main &AUX			
	48	5240	Main &AUX			
802.11n (HT40)	38	5190	Main &AUX			
	46	5230	Main &AUX	**13.3 & 13.3**	0.268	0.088

2. Back Screen

Mode	Ch. #	Freq. (MHz)	Antenna (Chain)	Avg. output Power (dB m)	Test Results (W/kg)	
					1g-SAR	10g-SAR
802.11n (HT20)	36	5180	AUX	16.0		
	40	5200	AUX	**16.0**	0.076	0.029
	48	5240	AUX	15.9		
802.11n (HT40)	38	5190	Main &AUX			
	46	5230	Main &AUX	**13.3 & 13.3**	0.062	0.025

<Note>

1. The test data reported are the worst-case SAR value with the position set in a typical configuration.
2. All modes of operation were investigated, and worst-case results are reported.
3. Liquid tissue depth was at least 15 cm.
4. The distance from EUT to flat phantom for testing Back position is 15 mm and Base position is no gap.
5. According to KDB 248227, SAR is not required for 802.11g/n HT20/HT40 single chain channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels
6. Other position was not tested since the antenna distance to edge was greater than 5 cm per KDB616217.
7. The modes with highest output power channel were chosen for the conducted output power.
8. Base position and Back screen Position tested according to RSS-102 (Issue 4) standard.

Ambient Temperature (°C)	22.5
Liquid Temperature (°C)	22.5
Date	2012-01-20

5.3 GHz Body Test

1. Base

Mode	Ch. #	Freq. (MHz)	Antenna (Chain)	Avg. output Power (dB m)	Test Results (W/kg)	
					1g-SAR	10g-SAR
802.11n (HT20)	52	5260	Main	16.1		
	60	5300	Main	**16.6**	0.294	0.086
	64	5320	Main	16.6		
802.11a Legacy	52	5260	AUX	15.3		
	60	5300	AUX	15.4		
	64	5320	AUX	**15.9**	0.446	0.159
802.11n (HT20)	52	5260	Main &AUX			
	60	5300	Main &AUX			
	64	5320	Main &AUX	**12.9 & 13.0**	0.157	0.052
802.11n (HT40)	54	5270	Main &AUX	**12.5 & 12.4**	0.204	0.069
	62	5310	Main &AUX			

2. Back Screen

Mode	Ch. #	Freq. (MHz)	Antenna (Chain)	Avg. output Power (dB m)	Test Results (W/kg)	
					1g-SAR	10g-SAR
802.11n Legacy	52	5260	AUX	15.3		
	60	5300	AUX	15.4		
	64	5320	AUX	**15.9**	0.047	0.019
802.11n (HT40)	54	5270	Main &AUX	**12.5 & 12.4**	0.076	0.027
	62	5310	Main &AUX			

<Note>

1. The test data reported are the worst-case SAR value with the position set in a typical configuration.
2. All modes of operation were investigated, and worst-case results are reported.
3. Liquid tissue depth was at least 15 cm.
4. The distance from EUT to flat phantom for testing Back position is 15 mm and Base position is no gap.
5. According to KDB 248227, SAR is not required for 802.11g/n HT20/HT40 single chain channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels
6. Other position was not tested since the antenna distance to edge was greater than 5 cm per KDB616217.
7. The modes with highest output power channel were chosen for the conducted output power.
8. Base position and Back screen Position tested according to RSS-102 (Issue 4) standard.

Ambient Temperature (°C)	22.6
Liquid Temperature (°C)	22.6
Date	2012-01-25

5.5 GHz Body Test

1. Base

Mode	Ch. #	Freq. (MHz)	Antenna (Chain)	Avg. output Power (dB m)	Test Results (W/kg)	
					1g-SAR	10g-SAR
802.11a Legacy	100	5500	Main	16.4		
	116	5580	Main	**16.5**	0.578	0.175
	140	5700	Main	16.5		
802.11n (HT40)	100	5500	AUX	14.8		
	116	5580	AUX	**15.8**	0.669	0.177
	140	5700	AUX	15.6		
802.11n (HT20)	100	5500	Main &AUX			
	116	5580	Main &AUX	**12.7 & 13.2**	0.391	0.125
	140	5700	Main &AUX			
802.11n (HT40)	102	5510	Main &AUX			
	110	5550	Main &AUX	**12.8 & 12.9**	0.507	0.158
	134	5670	Main &AUX			

2. Back Screen

Mode	Ch. #	Freq. (MHz)	Antenna (Chain)	Avg. output Power (dB m)	Test Results (W/kg)	
					1g-SAR	10g-SAR
802.11n (HT40)	100	5500	AUX	14.8		
	116	5580	AUX	**15.8**	0.137	0.055
	140	5700	AUX	15.6		
802.11n (HT40)	102	5510	Main &AUX			
	110	5550	Main &AUX	**12.8 & 12.9**	0.089	0.034
	134	5670	Main &AUX			

<Note>

1. The test data reported are the worst-case SAR value with the position set in a typical configuration.
2. All modes of operation were investigated, and worst-case results are reported.
3. Liquid tissue depth was at least 15 cm.
4. The distance from EUT to flat phantom for testing Back position is 15 mm and Base position is no gap.
5. According to KDB 248227, SAR is not required for 802.11g/n HT20/HT40 single chain channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels
6. Other position was not tested since the antenna distance to edge was greater than 5 cm per KDB616217.
7. The modes with highest output power channel were chosen for the conducted output power
8. Base position and Back screen Position tested according to RSS-102 (Issue 4) standard.

Ambient Temperature (°C)	22.8
Liquid Temperature (°C)	22.8
Date	2012-01-26

5.8 GHz Body Test

1. Base

Mode	Ch. #	Freq. (MHz)	Antenna (Chain)	Avg. output Power (dB m)	Test Results (W/kg)	
					1g-SAR	10g-SAR
802.11n (HT20)	149	5745	Main	**16.6**	0.336	0.104
	157	5785	Main	16.5		
	165	5825	Main	16.5		
802.11n Legacy	149	5745	AUX	16.7		
	157	5785	AUX	**16.7**	0.701	0.237
	165	5825	AUX	16.6		
802.11n (HT20)	149	5745	Main &AUX	**13.4 & 13.2**	0.218	0.072
	157	5785	Main &AUX			
	165	5825	Main &AUX			
802.11n (HT40)	151	5755	Main &AUX	**13.4 & 13.4**	0.228	0.076
	159	5795	Main &AUX			

2. Back Screen

Mode	Ch. #	Freq. (MHz)	Antenna (Chain)	Avg. output Power (dB m)	Test Results (W/kg)	
					1g-SAR	10g-SAR
802.11n Legacy	149	5745	AUX	16.7		
	157	5785	AUX	**16.7**	0.119	0.048
	165	5825	AUX	16.6		
802.11n (HT40)	151	5755	Main &AUX	**13.4 & 13.4**	0.095	0.033
	159	5795	Main &AUX			

<Note>

1. The test data reported are the worst-case SAR value with the position set in a typical configuration.
2. All modes of operation were investigated, and worst-case results are reported.
3. Liquid tissue depth was at least 15 cm.
4. The distance from EUT to flat phantom for testing Back position is 15 mm and Base position is no gap.
5. According to KDB 248227, SAR is not required for 802.11g/n HT20/HT40 single chain channels when the maximum average output power is less than 1/4 dB higher than that measured on the corresponding 802.11b channels
6. Other position was not tested since the antenna distance to edge was greater than 5 cm per KDB616217.
7. The modes with highest output power channel were chosen for the conducted output power
8. Base position and Back screen Position tested according to RSS-102 (Issue 4) standard.

Appendix

List

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

Appendix A

Test Plot - DASY4 Report

2450 ㎒ Validation Test_Body

Date: 2012-01-19

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

Input Power : 100 mW

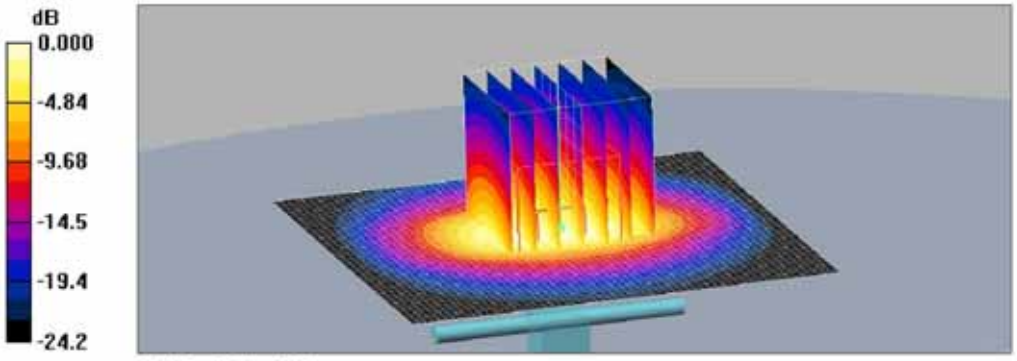
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:734
Program Name: Validation 2450 MHz_Body

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 51; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1782; ConvF(3.94, 3.94, 3.94); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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

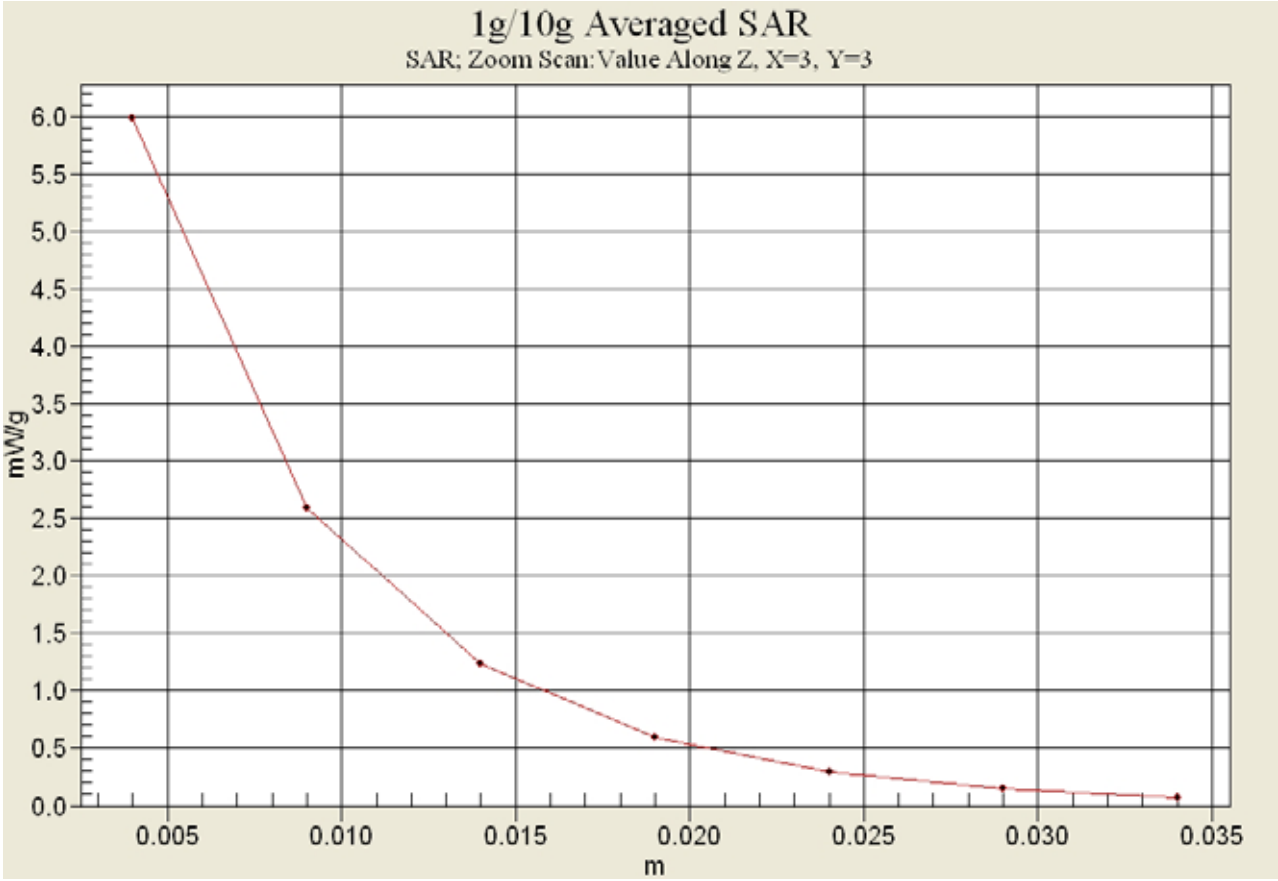
Validation 2450 MHz_Body/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 6.49 mW/g

Validation 2450 MHz_Body/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 49.7 V/m; Power Drift = 0.004 dB
Peak SAR (extrapolated) = 13.7 W/kg
SAR(1 g) = 5.44 mW/g; SAR(10 g) = 2.42 mW/g
Maximum value of SAR (measured) = 5.98 mW/g



0 dB = 5.98mW/g

Z Scan


1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=3, Y=3
mW/g
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

5200 ㎒ Validation Test_Body

Date: 2012-01-20

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

Input Power : 100 mW

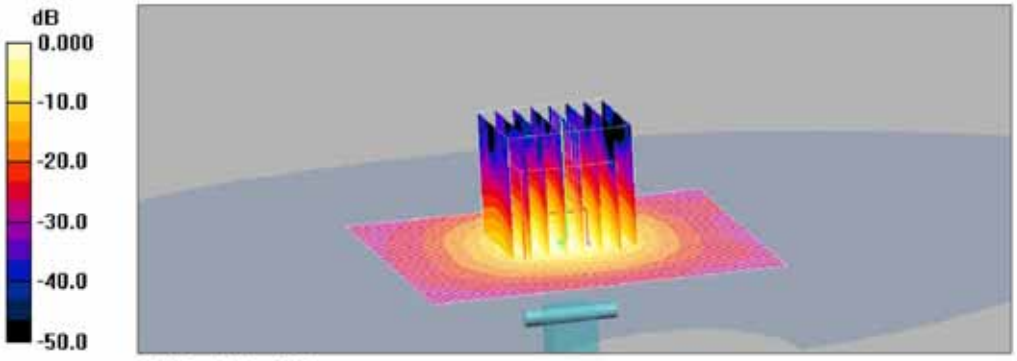
DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1106
Program Name: Validation

Communication System: CW; Frequency: 5200 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5200 MHz; σ = 5.23 mho/m; ε_r = 48.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.96, 3.96, 3.96); Calibrated: 2011-06-21
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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

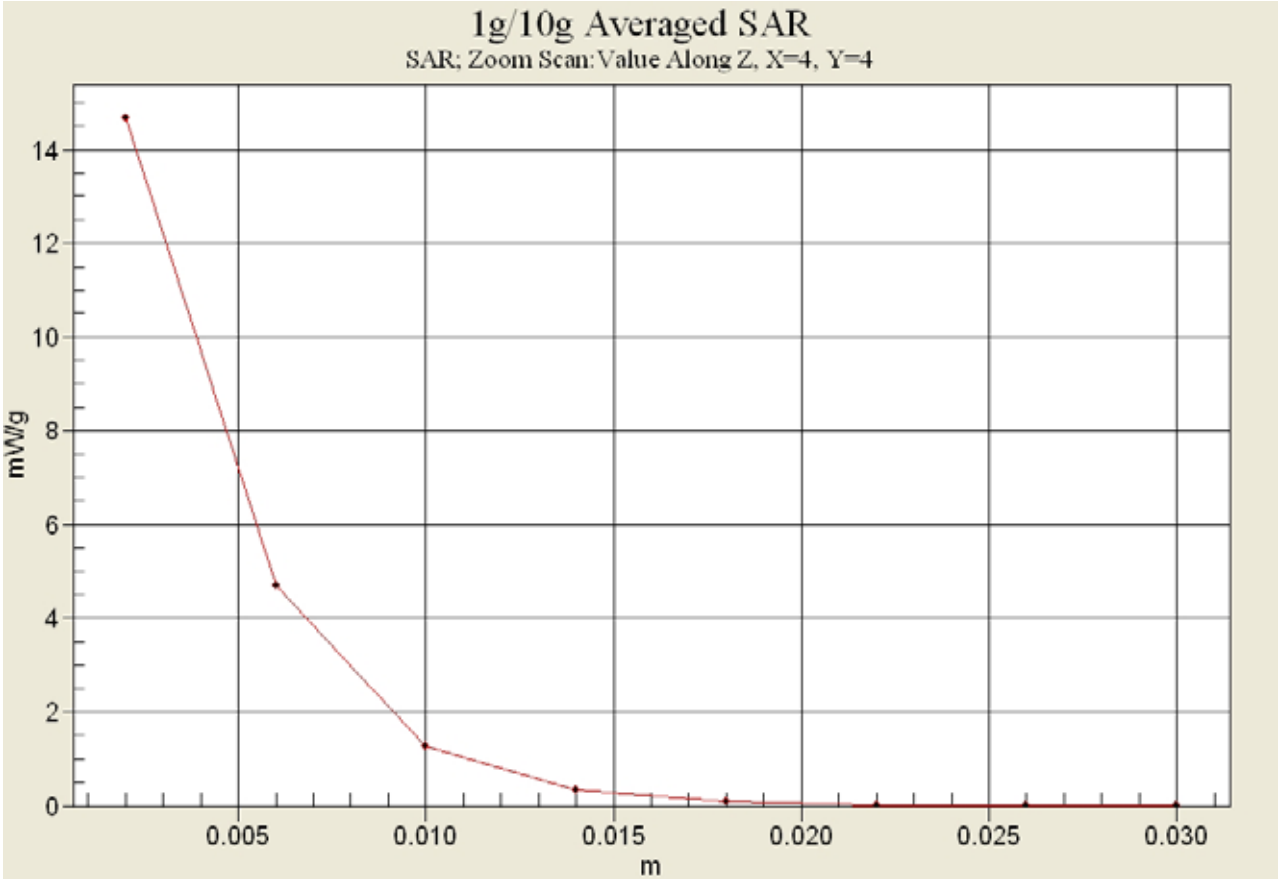
Validation 5200_Body/Area Scan (81x81x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 15.0 mW/g

Validation 5200_Body/Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=4mm
Reference Value = 51.6 V/m; Power Drift = -0.185 dB
Peak SAR (extrapolated) = 28.0 W/kg
SAR(1 g) = 7.45 mW/g; SAR(10 g) = 2.11 mW/g
Maximum value of SAR (measured) = 14.7 mW/g



0 dB = 14.7mW/g

Z Scan


1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=4, Y=4
mW/g
14
12
10
8
6
4
2
0
0.005
0.010
0.015
0.020
0.025
0.030
m

5500 ㎒ Validation Test_Body

Date: 2012-01-25

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

Input Power : 100 mW

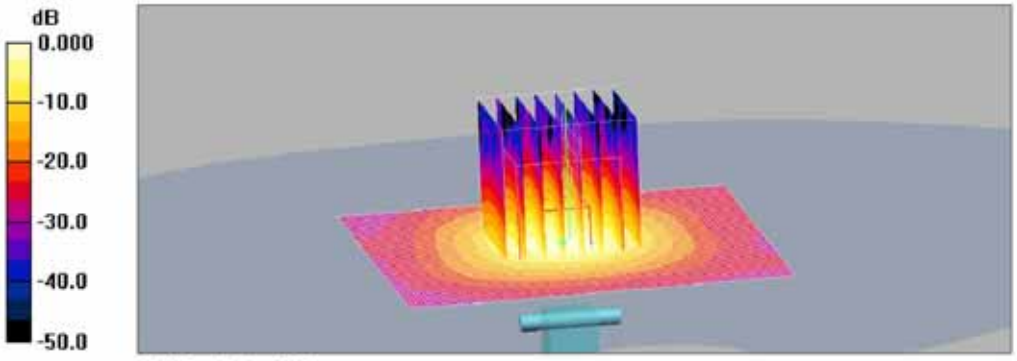
DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1106
Program Name: Validation

Communication System: CW; Frequency: 5500 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5500 MHz; σ = 5.66 mho/m; ε_r = 48.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.48, 3.48, 3.48); Calibrated: 2011-06-21
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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

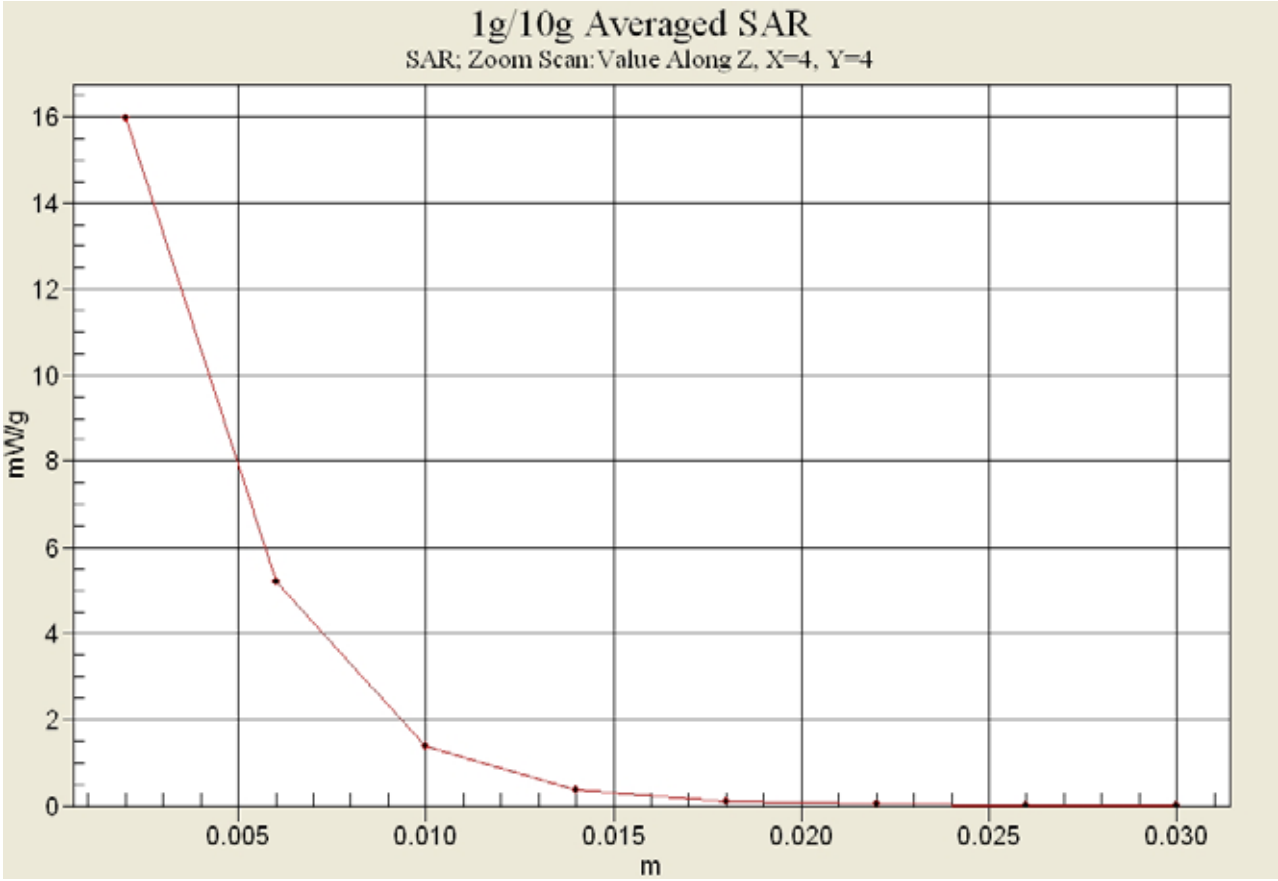
Validation 5500_Body/Area Scan (81x81x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 18.8 mW/g

Validation 5500_Body/Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=4mm
Reference Value = 55.1 V/m; Power Drift = -0.125 dB
Peak SAR (extrapolated) = 29.7 W/kg
SAR(1 g) = 8.07 mW/g; SAR(10 g) = 2.29 mW/g
Maximum value of SAR (measured) = 16.0 mW/g



0 dB = 16.0mW/g

Z Scan


1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=4, Y=4
mW/g
16
14
12
10
8
6
4
2
0
0.005
0.010
0.015
0.020
0.025
0.030
m

5800 ㎒ Validation Test_Body

Date: 2012-01-26

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

Input Power : 100 mW

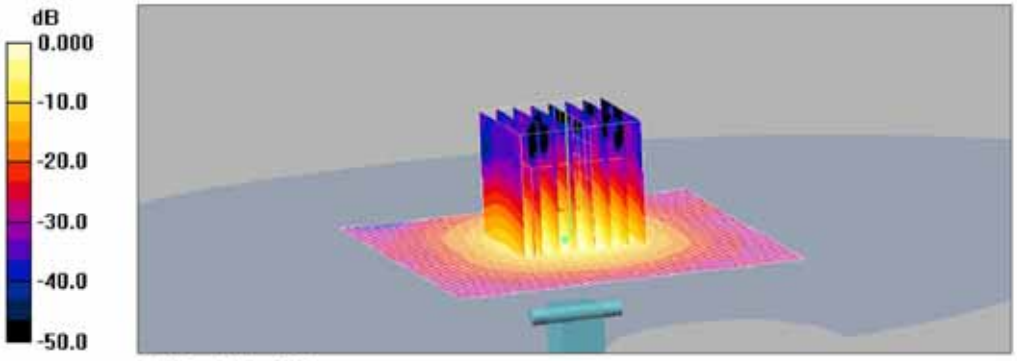
DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1106
Program Name: Validation

Communication System: CW; Frequency: 5800 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5800 MHz; σ = 6.27 mho/m; ε_r = 47.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.66, 3.66, 3.66); Calibrated: 2011-06-21
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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

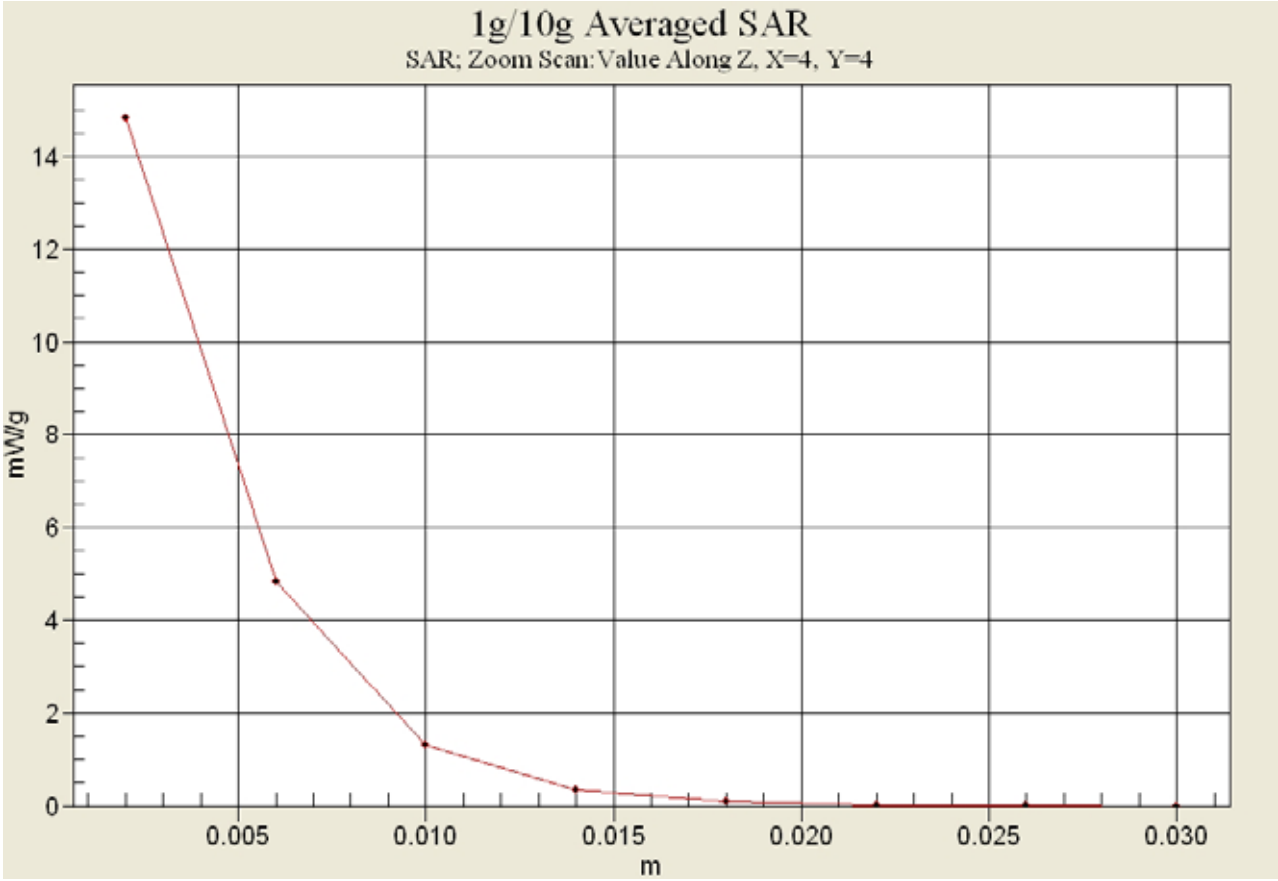
Validation 5800_Body/Area Scan (81x81x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 15.1 mW/g

Validation 5800_Body/Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=4mm
Reference Value = 48.0 V/m; Power Drift = -0.033 dB
Peak SAR (extrapolated) = 28.1 W/kg
SAR(1 g) = 7.73 mW/g; SAR(10 g) = 2.2 mW/g
Maximum value of SAR (measured) = 14.8 mW/g



0 dB = 14.8mW/g

Z Scan


1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=4, Y=4
mW/g
14
12
10
8
6
4
2
0
0.005
0.010
0.015
0.020
0.025
0.030
m

2.4 ㎓ Body SAR Test

Date: 2012-01-19

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

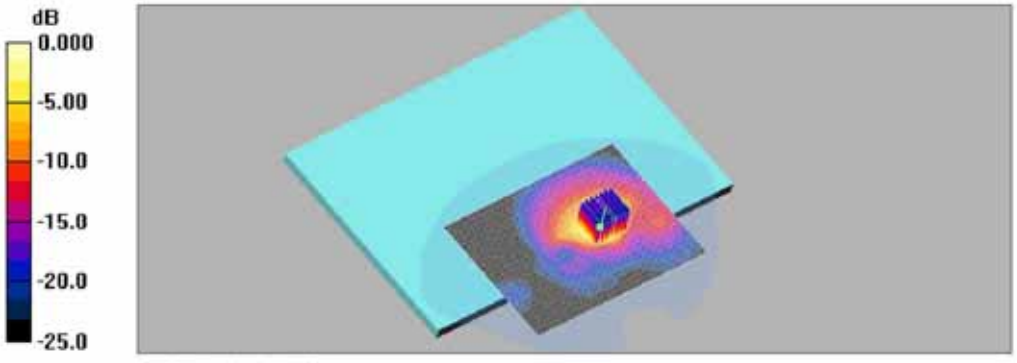
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2412 MHz; σ = 1.94 mho/m; ε_r = 51.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1782; ConvF(3.94, 3.94, 3.94); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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

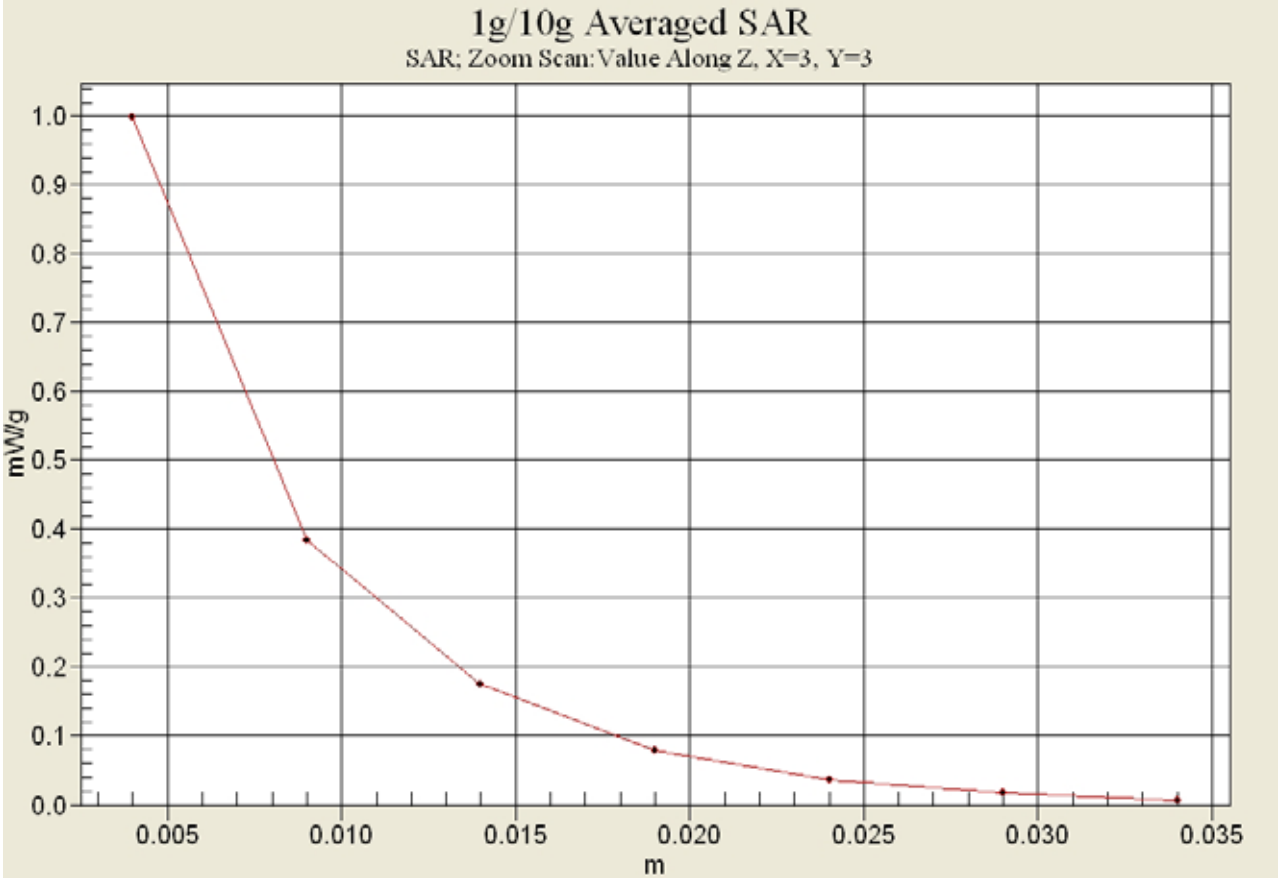
WLAN_11b_Low_Base_Main ANT/Area Scan (91x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.881 mW/g

WLAN_11b_Low_Base_Main ANT/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.12 V/m; Power Drift = -0.148 dB
Peak SAR (extrapolated) = 2.84 W/kg
SAR(1 g) = 0.904 mW/g; SAR(10 g) = 0.368 mW/g
Maximum value of SAR (measured) = 0.998 mW/g



0 dB = 0.998mW/g

Z Scan


1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=3, Y=3
mW/g
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

Date: 2012-01-19

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

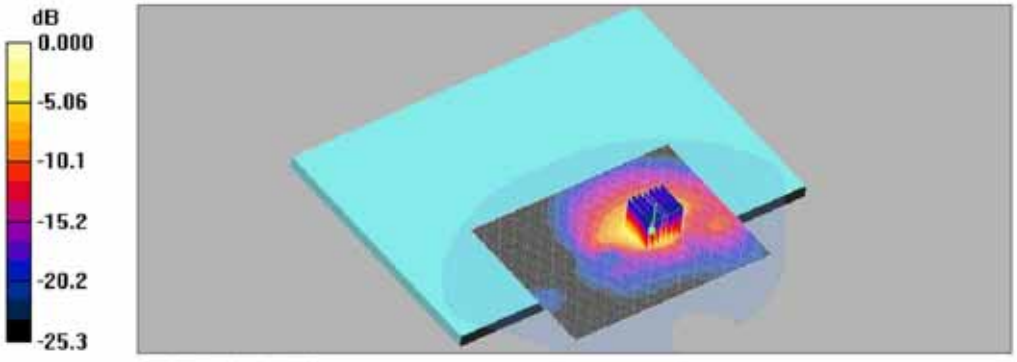
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.98 mho/m; ε_r = 51; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1782; ConvF(3.94, 3.94, 3.94); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11b_Mid_Base_Main ANT/Area Scan (91x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.848 mW/g

WLAN_11b_Mid_Base_Main ANT/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.41 V/m; Power Drift = 0.129 dB
Peak SAR (extrapolated) = 2.76 W/kg
SAR(1 g) = 0.873 mW/g; SAR(10 g) = 0.355 mW/g
Maximum value of SAR (measured) = 0.943 mW/g



0 dB = 0.943mW/g

Date: 2012-01-19

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

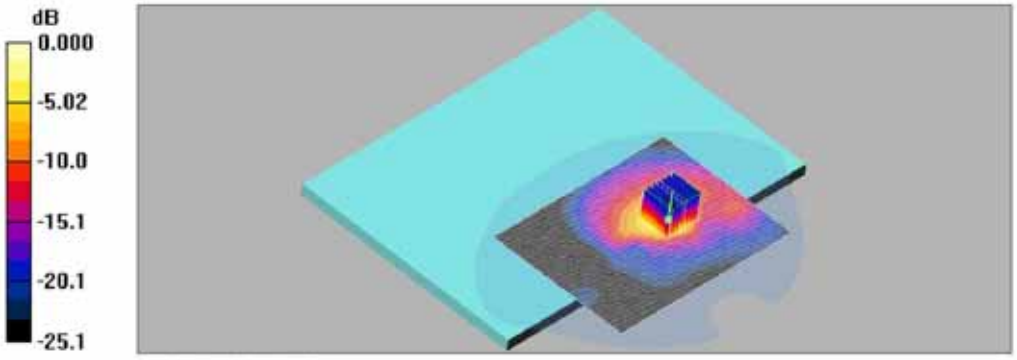
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2462 MHz; σ = 2.03 mho/m; ε_r = 51; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1782; ConvF(3.94, 3.94, 3.94); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11b_High_Base_Main ANT/Area Scan (91x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.830 mW/g

WLAN_11b_High_Base_Main ANT/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.11 V/m; Power Drift = -0.199 dB
Peak SAR (extrapolated) = 2.91 W/kg
SAR(1 g) = 0.880 mW/g; SAR(10 g) = 0.351 mW/g
Maximum value of SAR (measured) = 0.980 mW/g



0 dB = 0.980mW/g

Date: 2012-01-19

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

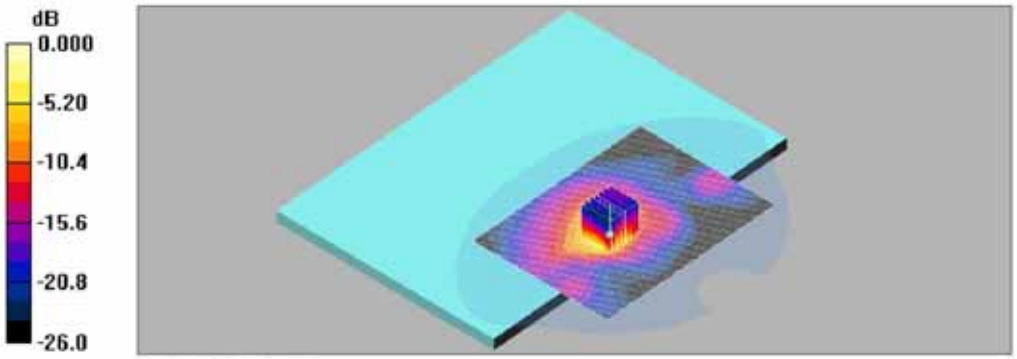
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2412 MHz; σ = 1.94 mho/m; ε_r = 51.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1782; ConvF(3.94, 3.94, 3.94); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11b_Low_Base_Aux ANT/Area Scan (91x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.683 mW/g

WLAN_11b_Low_Base_Aux ANT/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.81 V/m; Power Drift = -0.012 dB
Peak SAR (extrapolated) = 2.23 W/kg
SAR(1 g) = 0.713 mW/g; SAR(10 g) = 0.290 mW/g
Maximum value of SAR (measured) = 0.779 mW/g



0 dB = 0.779mW/g

Date: 2012-01-19

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

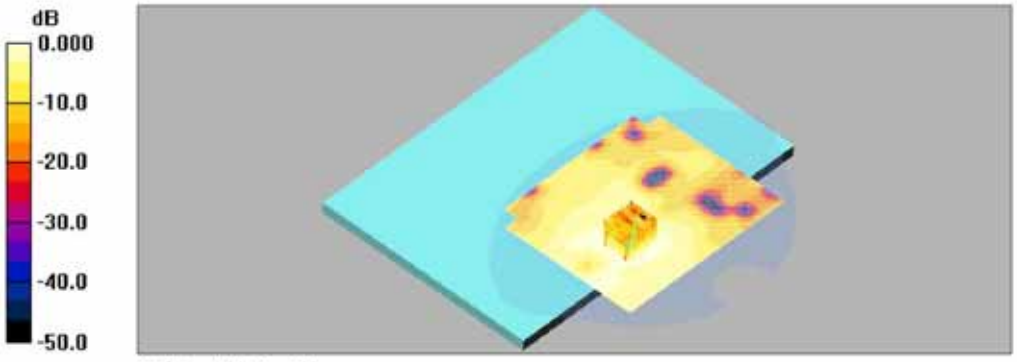
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2412 MHz; σ = 1.94 mho/m; ε_r = 51.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1782; ConvF(3.94, 3.94, 3.94); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11b_Low_Back Screen_Main ANT/Area Scan (101x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.015 mW/g

WLAN_11b_Low_Back Screen_Main ANT/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.84 V/m; Power Drift = -0.159 dB
Peak SAR (extrapolated) = 0.035 W/kg
SAR(1 g) = 0.015 mW/g; SAR(10 g) = 0.00727 mW/g
Maximum value of SAR (measured) = 0.016 mW/g



0 dB = 0.016mW/g

Date: 2012-01-19

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_Base_AUX&Main ANT_HT20.da4

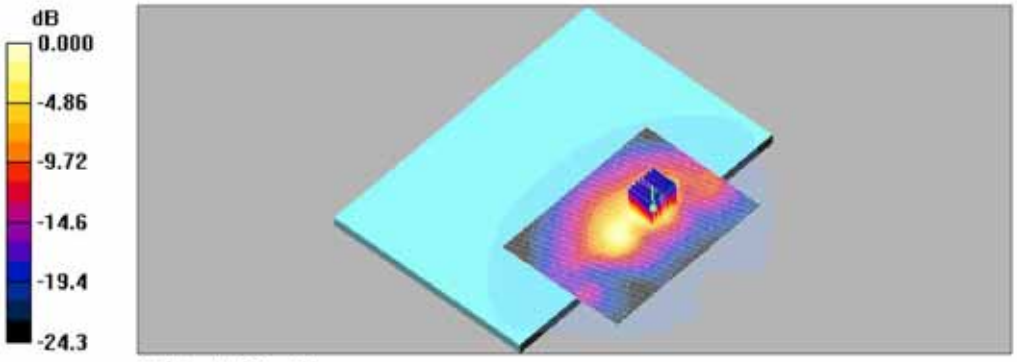
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.98 mho/m; ε_r = 51; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1782; ConvF(3.94, 3.94, 3.94); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11n(HT20)_Mid_Base_Main&Aux ANT/Area Scan (91x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.439 mW/g

WLAN_11n(HT20)_Mid_Base_Main&Aux ANT/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.45 V/m; Power Drift = 0.098 dB
Peak SAR (extrapolated) = 1.41 W/kg
SAR(1 g) = 0.445 mW/g; SAR(10 g) = 0.186 mW/g
Maximum value of SAR (measured) = 0.486 mW/g



0 dB = 0.486mW/g

Date: 2012-01-19

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_Base_AUX&Main ANT_HT40.da4

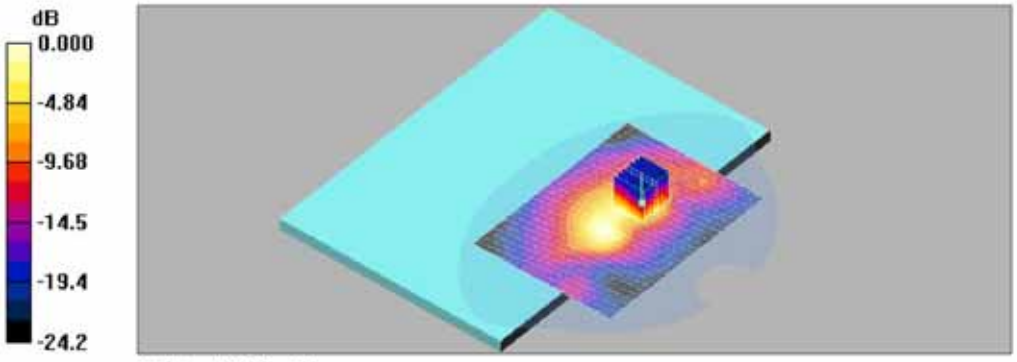
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.98 mho/m; ε_r = 51; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1782; ConvF(3.94, 3.94, 3.94); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11n(HT40)_Mid_Base_Main&Aux ANT/Area Scan (91x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.303 mW/g

WLAN_11n(HT40)_Mid_Base_Main&Aux ANT/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.26 V/m; Power Drift = -0.193 dB
Peak SAR (extrapolated) = 0.966 W/kg
SAR(1 g) = 0.310 mW/g; SAR(10 g) = 0.131 mW/g
Maximum value of SAR (measured) = 0.339 mW/g



0 dB = 0.339mW/g

Date: 2012-01-19

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_BackScreen_AUX&Main ANT_HT20.da4

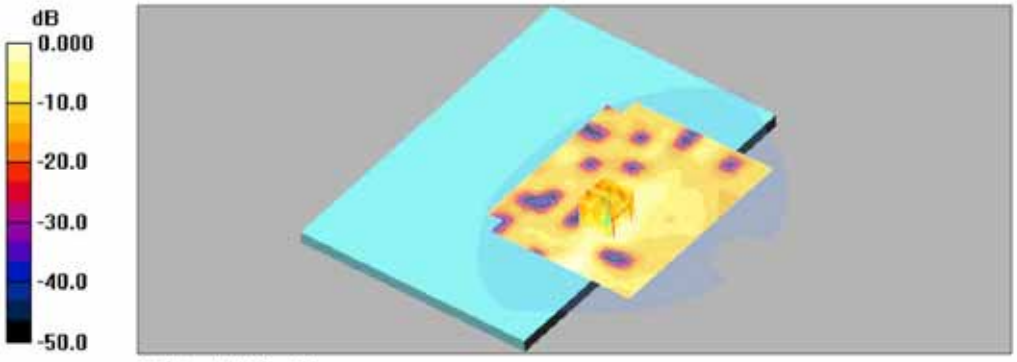
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.98 mho/m; ε_r = 51; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ET3DV6 - SN1782; ConvF(3.94, 3.94, 3.94); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11b_Mid_Back_Screen_AUX &Main ANT_HT20/Area Scan (101x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.008 mW/g

WLAN_11b_Mid_Back_Screen_AUX &Main ANT_HT20/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.14 V/m; Power Drift = -0.113 dB
Peak SAR (extrapolated) = 0.035 W/kg
SAR(1 g) = 0.00868 mW/g; SAR(10 g) = 0.00301 mW/g
Maximum value of SAR (measured) = 0.009 mW/g



0 dB = 0.009mW/g

Date: 2012-01-20

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_Base_Main ANT_UNII-Low(5200).da4

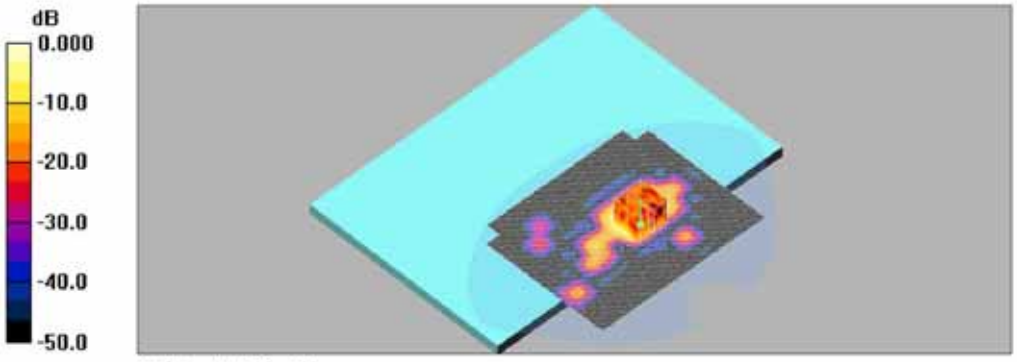
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Low); Frequency: 5200 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5200 MHz; σ = 5.23 mho/m; ε_r = 48.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.96, 3.96, 3.96); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11a_5200 MHz_Base_U-NII Low_Main ANT/Area Scan (101x121x1): Measurement grid:
dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.370 mW/g

WLAN_11a_5200 MHz_Base_U-NII Low_Main ANT/Zoom Scan (7x7x7)/Cube 0: Measurement grid:
dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.49 V/m; Power Drift = -0.168 dB
Peak SAR (extrapolated) = 1.10 W/kg
SAR(1 g) = 0.348 mW/g; SAR(10 g) = 0.096 mW/g
Maximum value of SAR (measured) = 0.458 mW/g



0 dB = 0.458mW/g

Date: 2012-01-20

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_Base_AUX ANT_UNII-Low(5200).da4

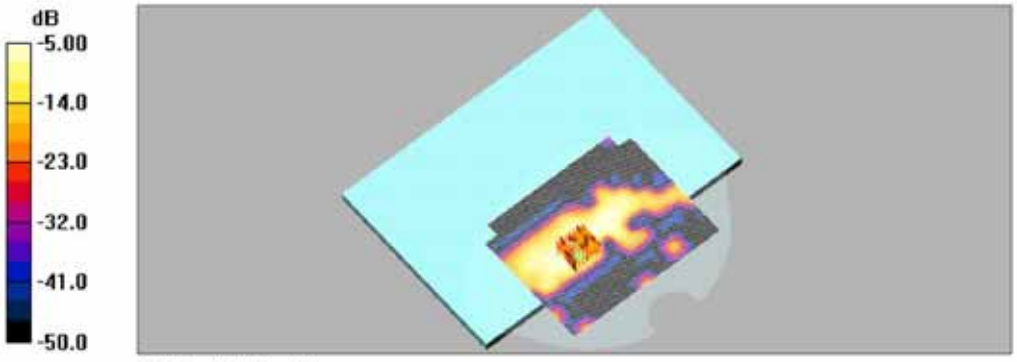
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Low); Frequency: 5200 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5200 MHz; σ = 5.23 mho/m; ε_r = 48.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.96, 3.96, 3.96); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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

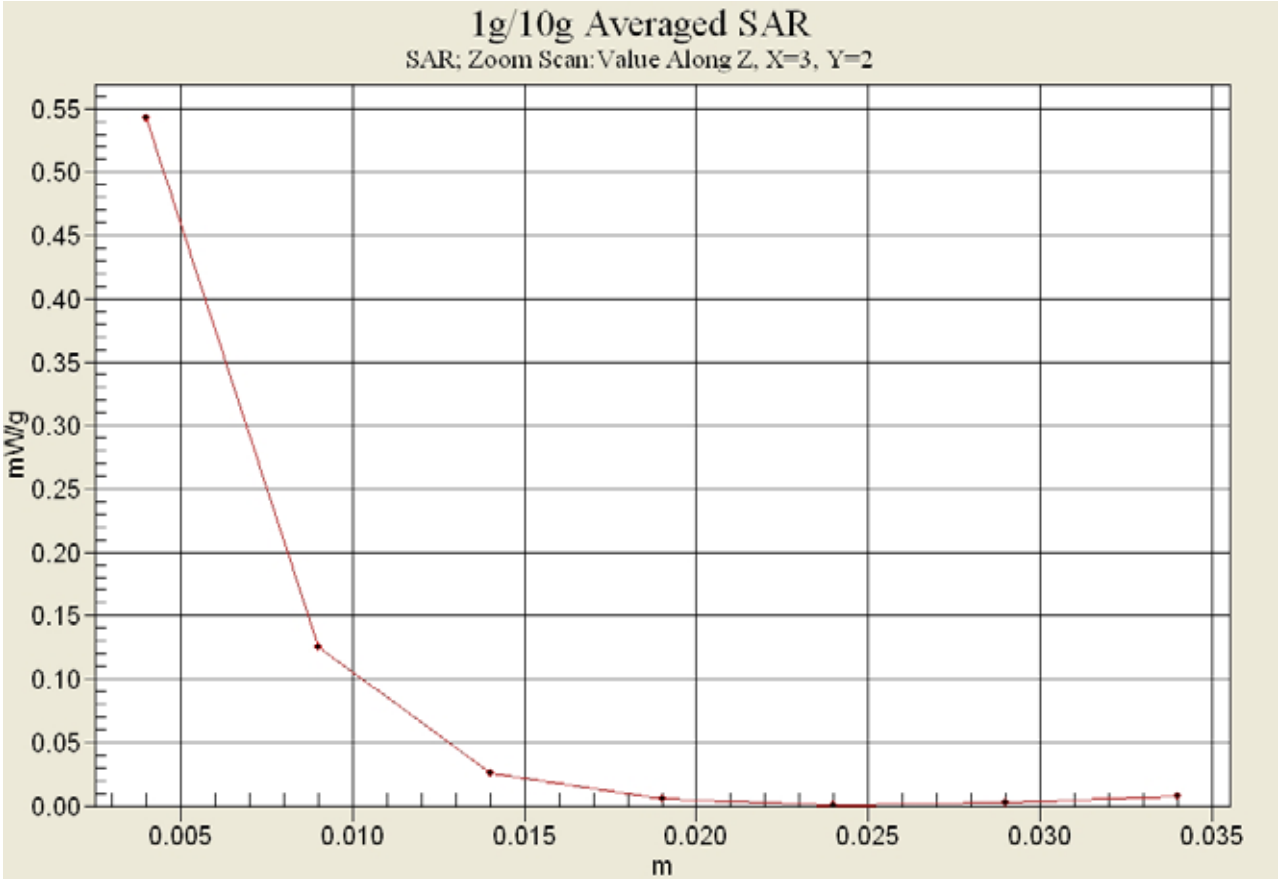
WLAN_11a_5200 MHz_Base_U-NII Low_AUX ANT/Area Scan (101x121x1): Measurement grid:
dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.376 mW/g

WLAN_11a_5200 MHz_Base_U-NII Low_AUX ANT/Zoom Scan (7x7x7)/Cube 0: Measurement grid:
dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.16 V/m; Power Drift = 0.133 dB
Peak SAR (extrapolated) = 2.17 W/kg
SAR(1 g) = 0.478 mW/g; SAR(10 g) = 0.146 mW/g
Maximum value of SAR (measured) = 0.542 mW/g



0 dB = 0.542mW/g

Z Scan


1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=3, Y=2
mW/g
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

Date: 2012-01-20

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_BackScreen_AUX ANT_UNII-Mid(5200).da4

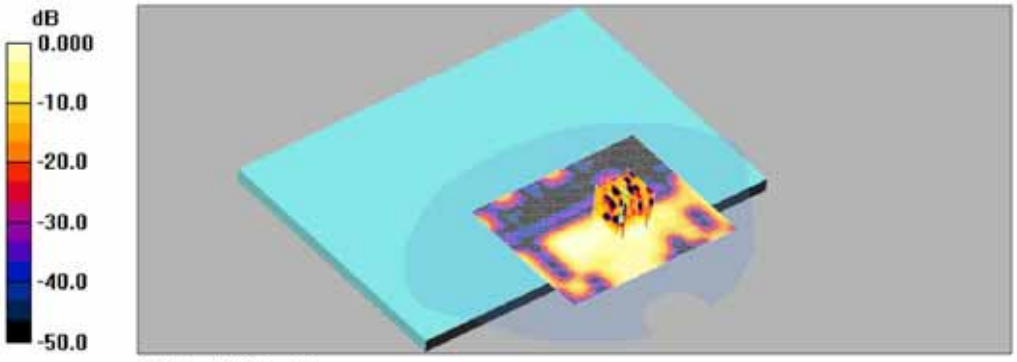
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Low); Frequency: 5200 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5200 MHz; σ = 5.23 mho/m; ε_r = 48.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.96, 3.96, 3.96); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11a_5200 MHz_Back_Screen_U-NII Low_AUX ANT/Area Scan (81x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.111 mW/g

WLAN_11a_5200 MHz_Back_Screen_U-NII Low_AUX ANT/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.63 V/m; Power Drift = -0.174 dB
Peak SAR (extrapolated) = 0.264 W/kg
SAR(1 g) = 0.076 mW/g; SAR(10 g) = 0.029 mW/g
Maximum value of SAR (measured) = 0.081 mW/g



0 dB = 0.081mW/g

Date: 2012-01-20

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_Base_Main+AUX ANT_UNII-Low(5180).da4

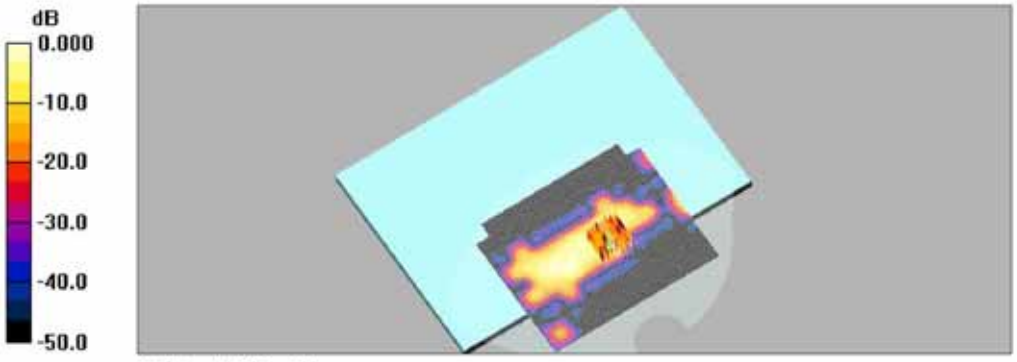
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Low); Frequency: 5180 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5180 MHz; σ = 5.21 mho/m; ε_r = 48.8; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.96, 3.96, 3.96); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11a_5180 MHz_Base_U-NII Low_Main&AUX ANT/Area Scan (101x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.244 mW/g

WLAN_11a_5180 MHz_Base_U-NII Low_Main&AUX ANT/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.76 V/m; Power Drift = -0.193 dB
Peak SAR (extrapolated) = 0.633 W/kg
SAR(1 g) = 0.192 mW/g; SAR(10 g) = 0.062 mW/g
Maximum value of SAR (measured) = 0.292 mW/g



0 dB = 0.292mW/g

Date: 2012-01-20

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_Base_Main+AUX ANT_UNII-Low(5230).da4

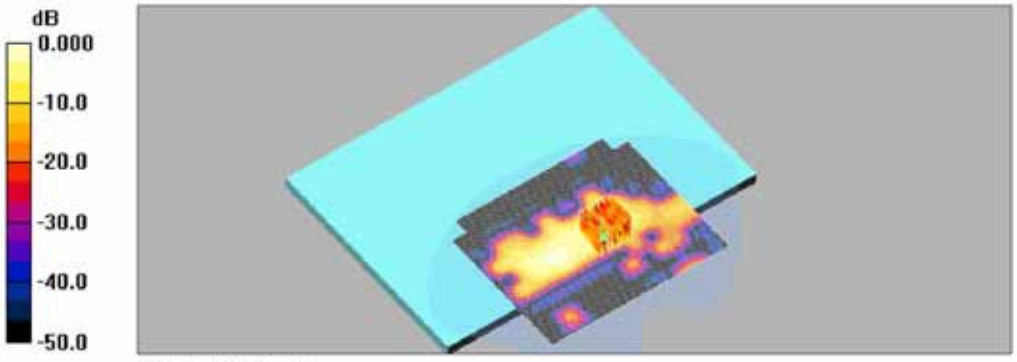
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Low); Frequency: 5230 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5230 MHz; σ = 5.27 mho/m; ε_r = 48.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.96, 3.96, 3.96); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11a_5230 MHz_Base_U-NII Low_Main&AUX ANT/Area Scan (101x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.294 mW/g

WLAN_11a_5230 MHz_Base_U-NII Low_Main&AUX ANT/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.95 V/m; Power Drift = 0.025 dB
Peak SAR (extrapolated) = 0.831 W/kg
SAR(1 g) = 0.268 mW/g; SAR(10 g) = 0.088 mW/g
Maximum value of SAR (measured) = 0.326 mW/g



0 dB = 0.326mW/g

Date: 2012-01-20

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_BackScreen_Main+AUX ANT_UNII-Low(5230).da4

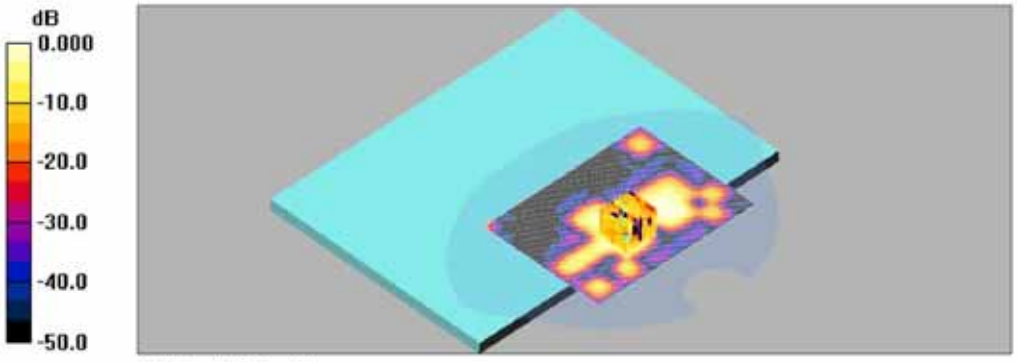
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Low); Frequency: 5230 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5230 MHz; σ = 5.27 mho/m; ε_r = 48.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.96, 3.96, 3.96); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11a_5230 MHz_Back_Screen_U-NII Low_Main+AUX ANT/Area Scan (81x111x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.119 mW/g

WLAN_11a_5230 MHz_Back_Screen_U-NII Low_Main+AUX ANT/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.23 V/m; Power Drift = 0.173 dB
Peak SAR (extrapolated) = 0.261 W/kg
SAR(1 g) = 0.062 mW/g; SAR(10 g) = 0.025 mW/g
Maximum value of SAR (measured) = 0.062 mW/g



0 dB = 0.062mW/g

Date: 2012-01-20

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_Base_Main ANT_UNII-Mid(5300).da4

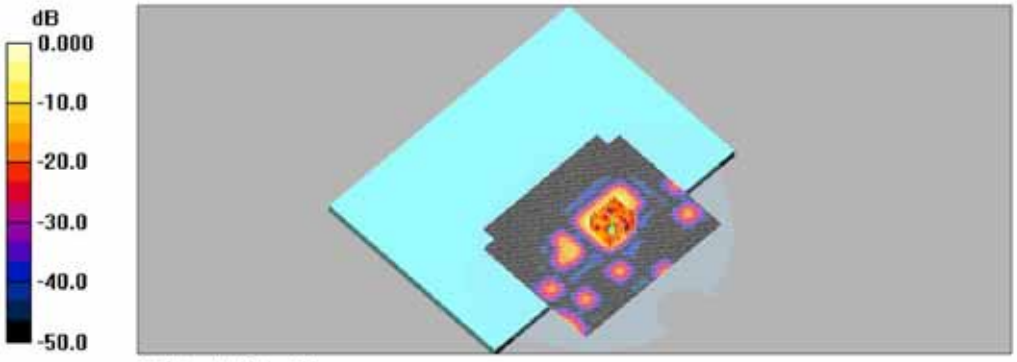
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Low); Frequency: 5300 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5300 MHz; σ = 5.36 mho/m; ε_r = 48.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.79, 3.79, 3.79); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11a_5300 MHz_Base_U-NII Low_Main ANT/Area Scan (101x121x1): Measurement grid:
dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.439 mW/g

WLAN_11a_5300 MHz_Base_U-NII Low_Main ANT/Zoom Scan (7x7x7)/Cube 0: Measurement grid:
dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.28 V/m; Power Drift = -0.195 dB
Peak SAR (extrapolated) = 0.879 W/kg
SAR(1 g) = 0.294 mW/g; SAR(10 g) = 0.086 mW/g
Maximum value of SAR (measured) = 0.434 mW/g



0 dB = 0.434mW/g

Date: 2012-01-20

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_Base_AUX ANT_UNII-Mid(5320).da4

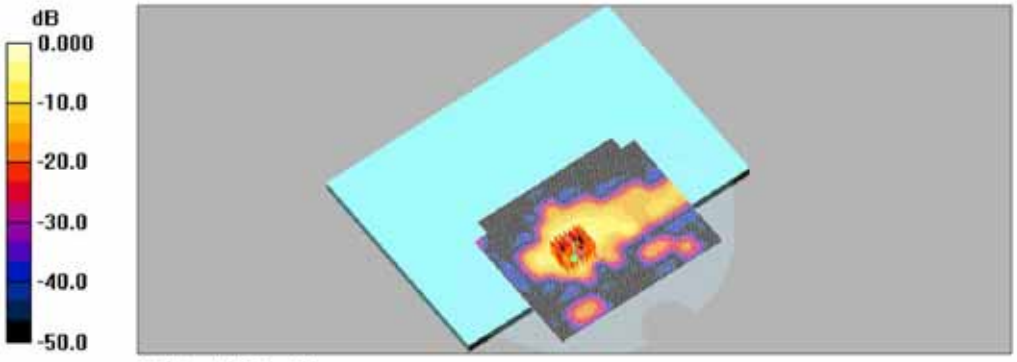
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Low); Frequency: 5320 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5320 MHz; σ = 5.39 mho/m; ε_r = 48.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.79, 3.79, 3.79); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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

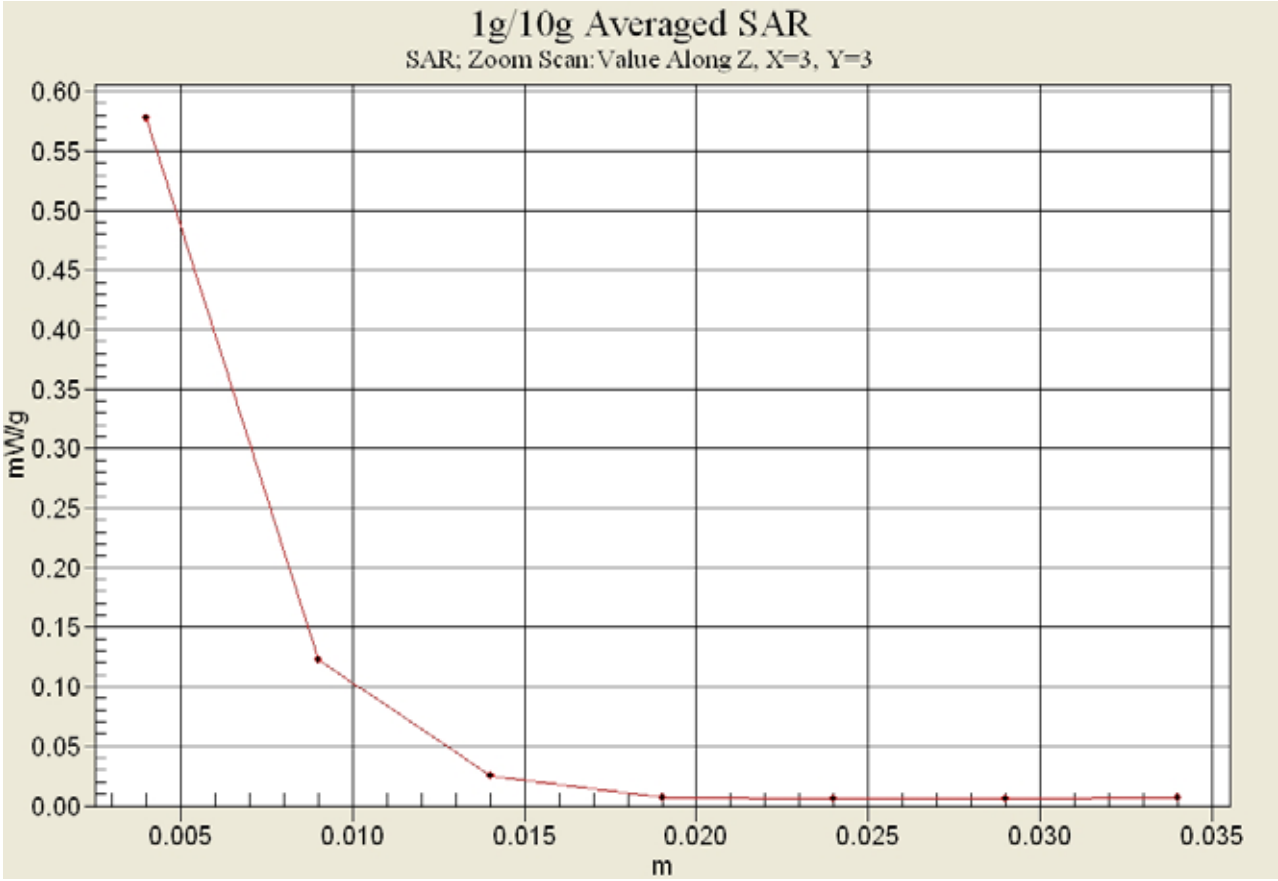
WLAN_11a_5320 MHz_Base_U-NII Low_AUX ANT/Area Scan (101x121x1): Measurement grid:
dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.452 mW/g

WLAN_11a_5320 MHz_Base_U-NII Low_AUX ANT/Zoom Scan (7x7x7)/Cube 0: Measurement grid:
dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.57 V/m; Power Drift = -0.125 dB
Peak SAR (extrapolated) = 1.32 W/kg
SAR(1 g) = 0.446 mW/g; SAR(10 g) = 0.159 mW/g
Maximum value of SAR (measured) = 0.577 mW/g



0 dB = 0.577mW/g

Z Scan


1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=3, Y=3
mW/g
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

Date: 2012-01-20

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_BackScreen_AUX ANT_UNII-Mid(5320).da4

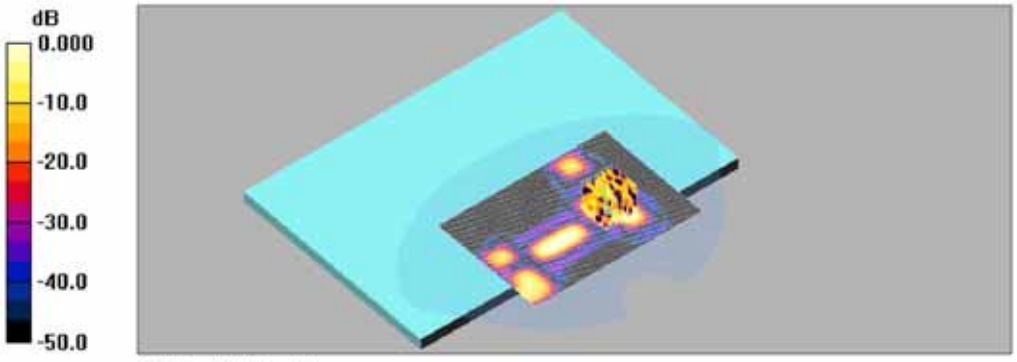
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Mid); Frequency: 5320 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5320 MHz; σ = 5.39 mho/m; ε_r = 48.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.79, 3.79, 3.79); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11a_5320 MHz_Back_Screen_U-NII Mid_AUX ANT/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.072 mW/g

WLAN_11a_5320 MHz_Back_Screen_U-NII Mid_AUX ANT/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.43 V/m; Power Drift = -0.069 dB
Peak SAR (extrapolated) = 0.236 W/kg
SAR(1 g) = 0.047 mW/g; SAR(10 g) = 0.019 mW/g
Maximum value of SAR (measured) = 0.041 mW/g



0 dB = 0.041mW/g

Date: 2012-01-20

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_Base_Main+AUX ANT_UNII-Mid(5320).da4

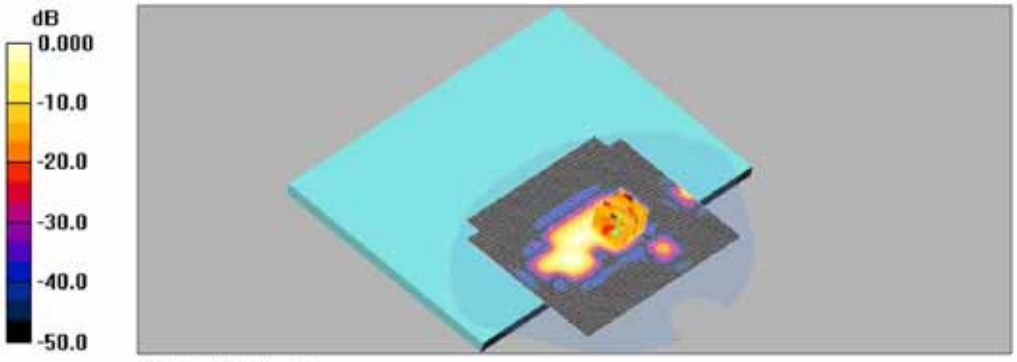
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Mid); Frequency: 5320 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5320 MHz; σ = 5.39 mho/m; ε_r = 48.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.79, 3.79, 3.79); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11a_5320 MHz_Base_U-NII Mid_Main&AUX ANT/Area Scan (101x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.209 mW/g

WLAN_11a_5320 MHz_Base_U-NII Mid_Main&AUX ANT/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.31 V/m; Power Drift = -0.010 dB
Peak SAR (extrapolated) = 0.468 W/kg
SAR(1 g) = 0.157 mW/g; SAR(10 g) = 0.052 mW/g
Maximum value of SAR (measured) = 0.210 mW/g



0 dB = 0.210mW/g

Date: 2012-01-20

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_Base_Main+AUX ANT_UNII-Mid(5270).da4

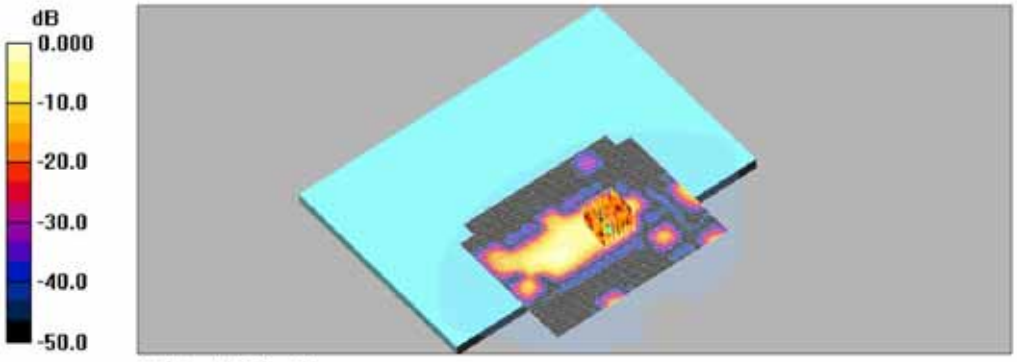
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Mid); Frequency: 5270 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5270 MHz; σ = 5.33 mho/m; ε_r = 48.6; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.79, 3.79, 3.79); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11a_5270 MHz_Base_U-NII Mid_Main&Aux ANT/Area Scan (101x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.232 mW/g

WLAN_11a_5270 MHz_Base_U-NII Mid_Main&Aux ANT/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.59 V/m; Power Drift = -0.111 dB
Peak SAR (extrapolated) = 0.589 W/kg
SAR(1 g) = 0.204 mW/g; SAR(10 g) = 0.069 mW/g
Maximum value of SAR (measured) = 0.279 mW/g



0 dB = 0.279mW/g

Date: 2012-01-20

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_BackScreen_Main+AUX ANT_UNII-Mid(5270).da4

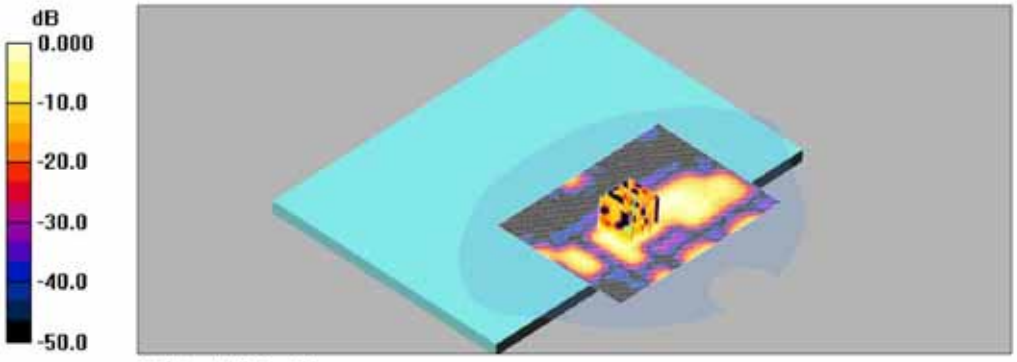
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Mid); Frequency: 5270 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5270 MHz; σ = 5.33 mho/m; ε_r = 48.6; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.79, 3.79, 3.79); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11a_5270 MHz_Back_Screen_U-NII Mid_AUX+Main ANT/Area Scan (81x111x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.115 mW/g

WLAN_11a_5270 MHz_Back_Screen_U-NII Mid_AUX+Main ANT/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.19 V/m; Power Drift = -0.089 dB
Peak SAR (extrapolated) = 0.374 W/kg
SAR(1 g) = 0.076 mW/g; SAR(10 g) = 0.027 mW/g
Maximum value of SAR (measured) = 0.062 mW/g



0 dB = 0.062mW/g

Date: 2012-01-25

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_Base_Main ANT_UNII-H or Cept(5580).da4

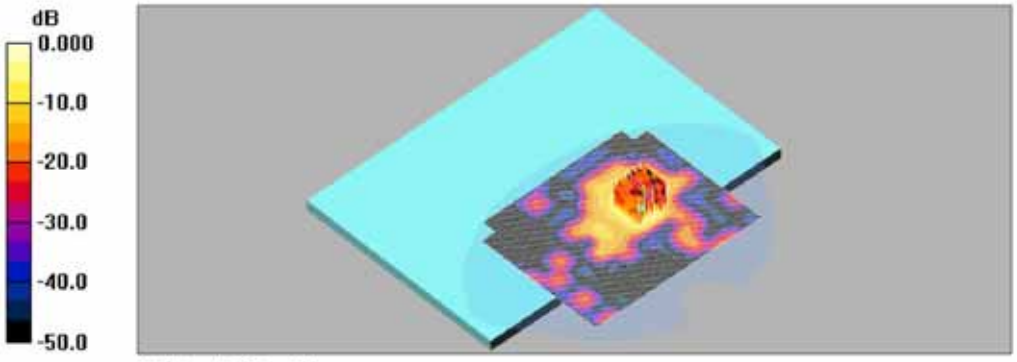
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_H or CEPT); Frequency: 5580 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5580 MHz; σ = 5.77 mho/m; ε_r = 48.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.26, 3.26, 3.26); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11a_5580 MHz_Base_U-NII Upper_Main ANT/Area Scan (101x121x1): Measurement grid:
dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.497 mW/g

WLAN_11a_5580 MHz_Base_U-NII Upper_Main ANT/Zoom Scan (7x7x7)/Cube 0: Measurement grid:
dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.11 V/m; Power Drift = -0.137 dB
Peak SAR (extrapolated) = 1.90 W/kg
SAR(1 g) = 0.578 mW/g; SAR(10 g) = 0.175 mW/g
Maximum value of SAR (measured) = 0.765 mW/g



0 dB = 0.765mW/g

Date: 2012-01-25

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_Base_AUX ANT_UNII-H or Cept(5550).da4

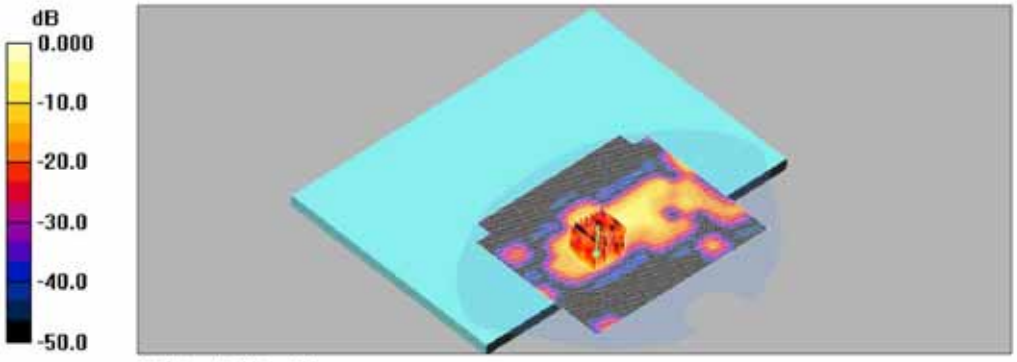
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_H or CEPT); Frequency: 5550 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5550 MHz; σ = 5.73 mho/m; ε_r = 48.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.48, 3.48, 3.48); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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

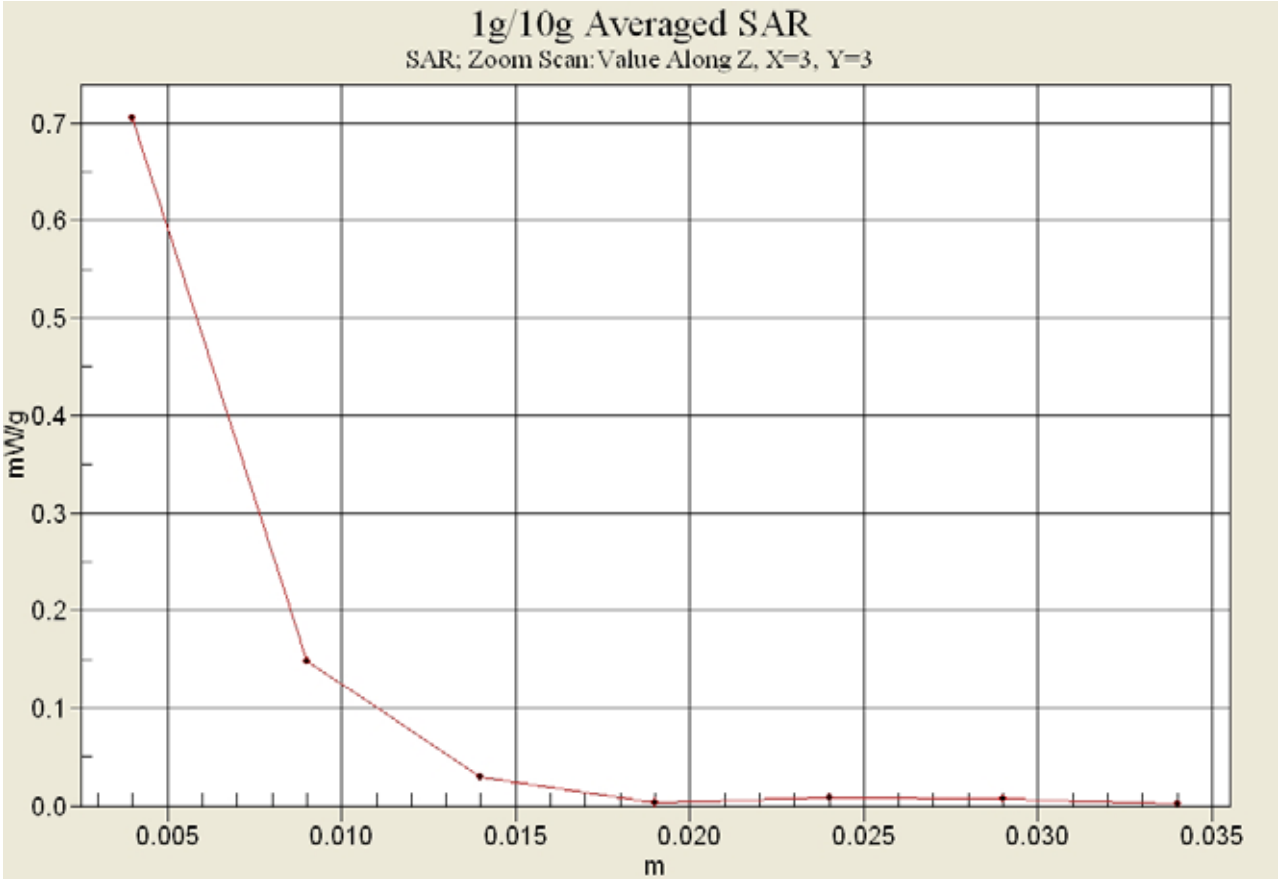
WLAN_11a_5550 MHz_Base_U-NII Upper_AUX ANT/Area Scan (101x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.509 mW/g

WLAN_11a_5550 MHz_Base_U-NII Upper_AUX ANT/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.62 V/m; Power Drift = -0.072 dB
Peak SAR (extrapolated) = 3.57 W/kg
SAR(1 g) = 0.669 mW/g; SAR(10 g) = 0.177 mW/g
Maximum value of SAR (measured) = 0.705 mW/g



0 dB = 0.705mW/g

Z Scan


1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=3, Y=3
mW/g
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

Date: 2012-01-25

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_BackScreen_AUX ANT_UNII-H or Cept(5550).da4

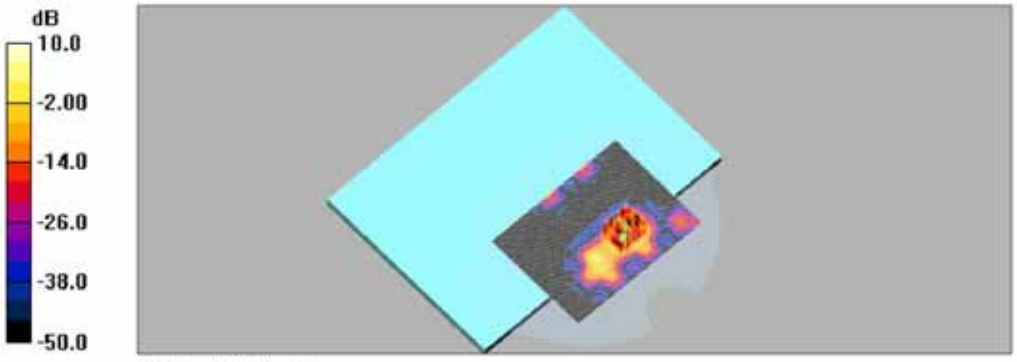
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_H or CEPT); Frequency: 5550 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5550 MHz; σ = 5.73 mho/m; ε_r = 48.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.48, 3.48, 3.48); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11a_5550 MHz_Back_Screen_U-NII Mid_AUX ANT/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.352 mW/g

WLAN_11a_5550 MHz_Back_Screen_U-NII Mid_AUX ANT/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.34 V/m; Power Drift = -0.009 dB
Peak SAR (extrapolated) = 0.531 W/kg
SAR(1 g) = 0.137 mW/g; SAR(10 g) = 0.055 mW/g
Maximum value of SAR (measured) = 0.140 mW/g



0 dB = 0.140mW/g

Date: 2012-01-25

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_Base_Main&AUX ANT_UNII-H or Cept(5580).da4

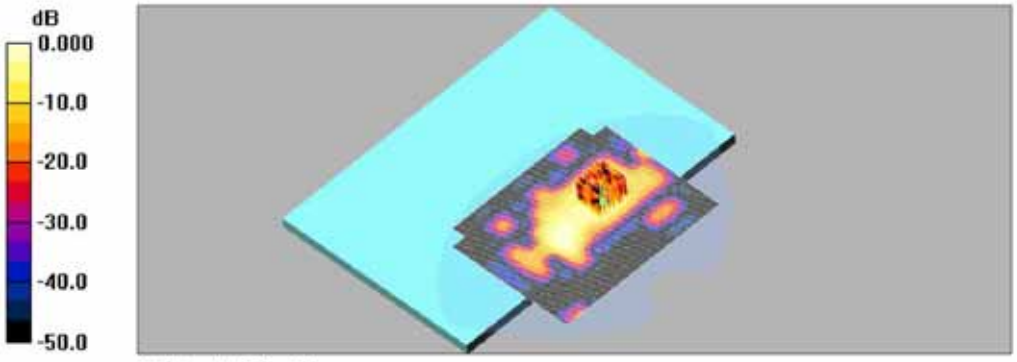
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_H or CEPT); Frequency: 5580 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5580 MHz; σ = 5.77 mho/m; ε_r = 48.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.26, 3.26, 3.26); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11a_5580 MHz_Base_U-NII Upper_Main&AUX ANT/Area Scan (101x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.437 mW/g

WLAN_11a_5580 MHz_Base_U-NII Upper_Main&AUX ANT/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.60 V/m; Power Drift = 0.162 dB
Peak SAR (extrapolated) = 1.22 W/kg
SAR(1 g) = 0.391 mW/g; SAR(10 g) = 0.125 mW/g
Maximum value of SAR (measured) = 0.479 mW/g



0 dB = 0.479mW/g

Date: 2012-01-25

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_Base_Main&AUX ANT_UNII-H or Cept(5550).da4

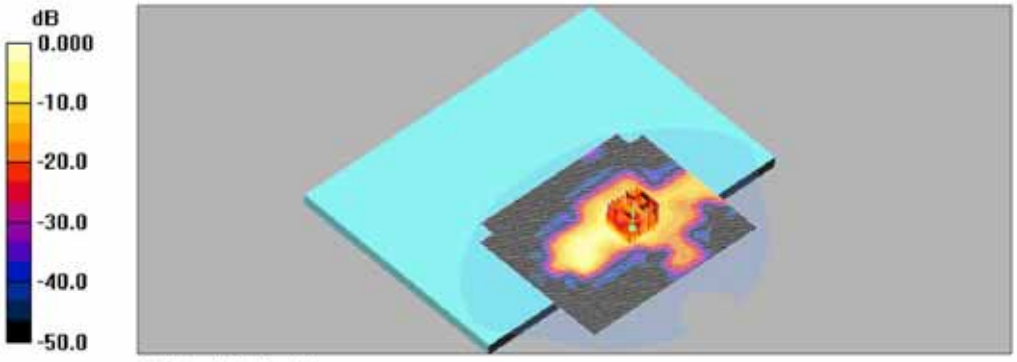
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_H or CEPT); Frequency: 5550 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5550 MHz; σ = 5.73 mho/m; ε_r = 48.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.48, 3.48, 3.48); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11a_5550 MHz_Base_U-NII Upper_Main&AUX ANT/Area Scan (101x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.416 mW/g

WLAN_11a_5550 MHz_Base_U-NII Upper_Main&AUX ANT/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.60 V/m; Power Drift = -0.086 dB
Peak SAR (extrapolated) = 1.67 W/kg
SAR(1 g) = 0.507 mW/g; SAR(10 g) = 0.158 mW/g
Maximum value of SAR (measured) = 0.658 mW/g



0 dB = 0.658mW/g

Date: 2012-01-25

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_BackScreen_Main+AUX ANT_UNII-H or Cept(5550).da4

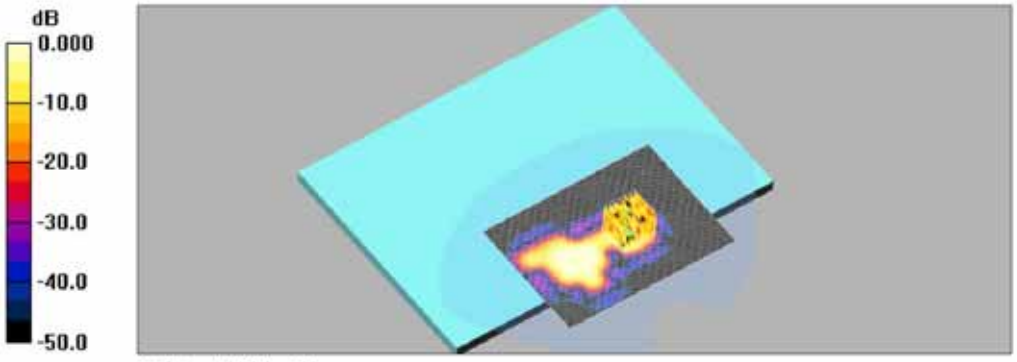
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_H or CEPT); Frequency: 5550 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5550 MHz; σ = 5.73 mho/m; ε_r = 48.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.48, 3.48, 3.48); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11a_5550 MHz_Back_Screen_U-NII Mid_AUX+Main ANT/Area Scan (81x111x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.278 mW/g

WLAN_11a_5550 MHz_Back_Screen_U-NII Mid_AUX+Main ANT/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.73 V/m; Power Drift = -0.172 dB
Peak SAR (extrapolated) = 0.401 W/kg
SAR(1 g) = 0.089 mW/g; SAR(10 g) = 0.034 mW/g
Maximum value of SAR (measured) = 0.090 mW/g



0 dB = 0.090mW/g

Date: 2012-01-26

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_Base_Main ANT_UNII-Upper(5745).da4

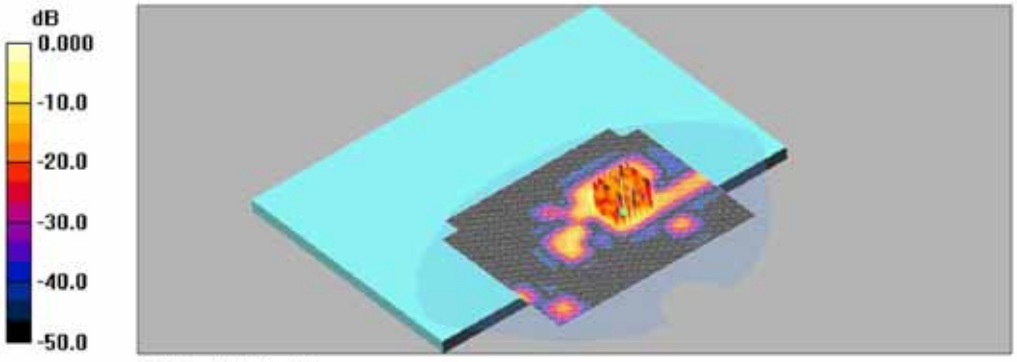
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Upper); Frequency: 5745 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5745 MHz; σ = 6.21 mho/m; ε_r = 47.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.66, 3.66, 3.66); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11a_5745 MHz_Base_U-NII Upper_Main ANT/Area Scan (101x121x1): Measurement grid:
dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.324 mW/g

WLAN_11a_5745 MHz_Base_U-NII Upper_Main ANT/Zoom Scan (7x7x7)/Cube 0: Measurement grid:
dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.18 V/m; Power Drift = 0.137 dB
Peak SAR (extrapolated) = 1.09 W/kg
SAR(1 g) = 0.336 mW/g; SAR(10 g) = 0.104 mW/g
Maximum value of SAR (measured) = 0.453 mW/g



0 dB = 0.453mW/g

Date: 2012-01-26

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_Base_AUX ANT_UNII-Upper(5785).da4

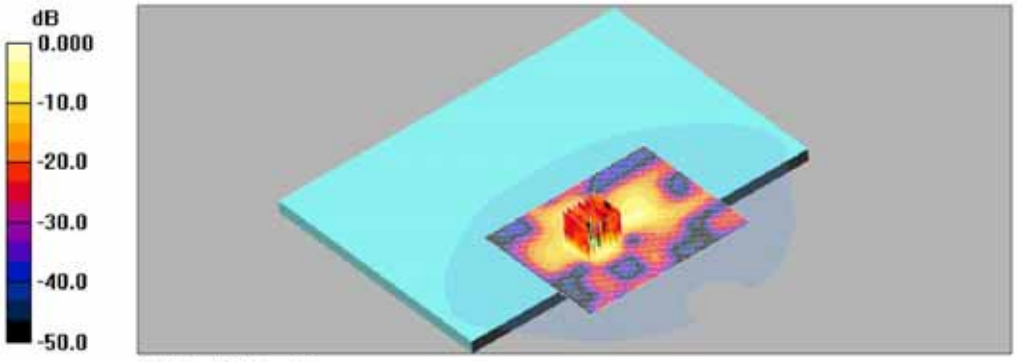
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Upper); Frequency: 5785 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5785 MHz; σ = 6.24 mho/m; ε_r = 48; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.66, 3.66, 3.66); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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

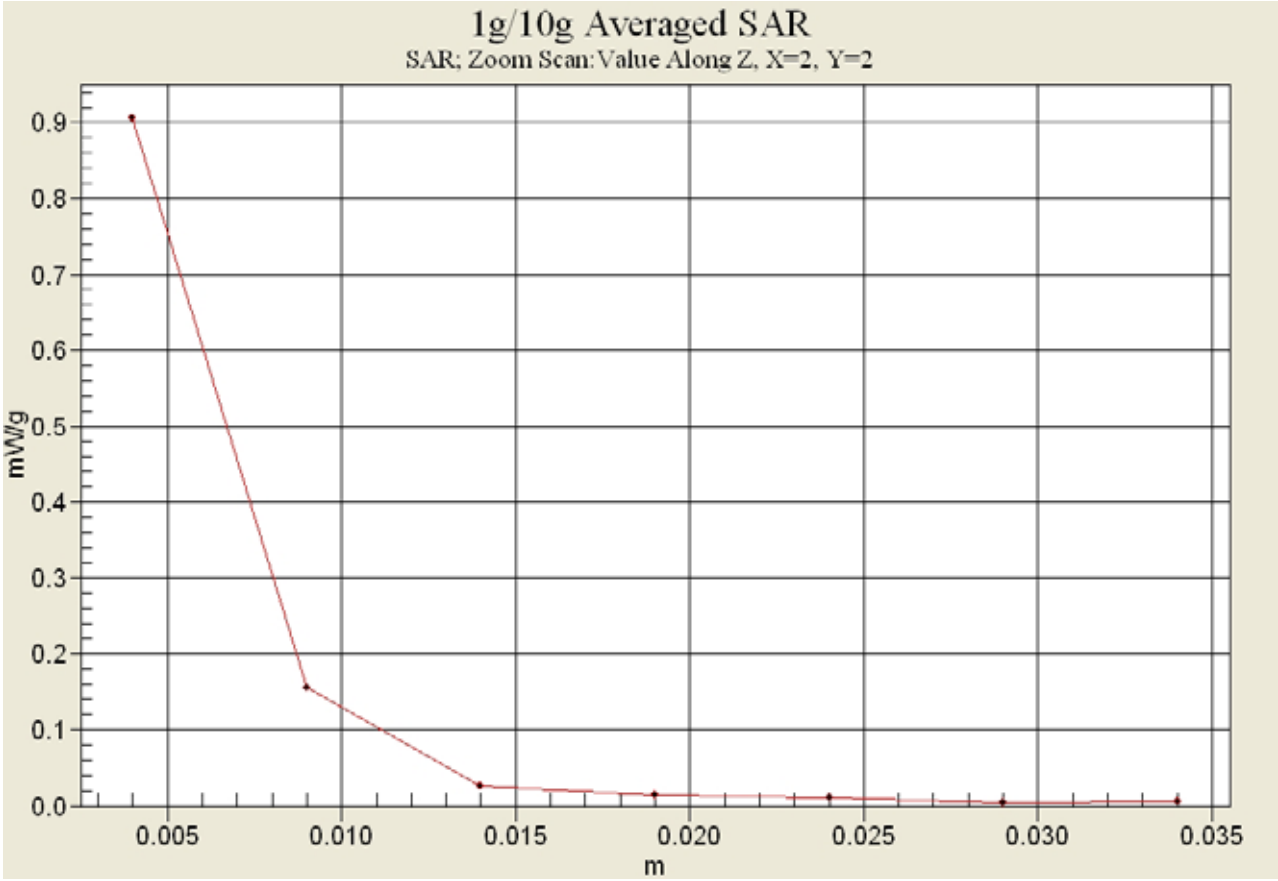
WLAN_11a_5785 MHz_Base_U-NII Upper_AUX ANT/Area Scan (81x101x1): Measurement grid:
dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.771 mW/g

WLAN_11a_5785 MHz_Base_U-NII Upper_AUX ANT/Zoom Scan (7x7x7)/Cube 0: Measurement grid:
dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.14 V/m; Power Drift = 0.177 dB
Peak SAR (extrapolated) = 2.32 W/kg
SAR(1 g) = 0.701 mW/g; SAR(10 g) = 0.237 mW/g
Maximum value of SAR (measured) = 0.905 mW/g



0 dB = 0.905mW/g

Z Scan


1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=2, Y=2
mW/g
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

Date: 2012-01-26

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_Back screen_AUX ANT_UNII-Upper(5785).da4

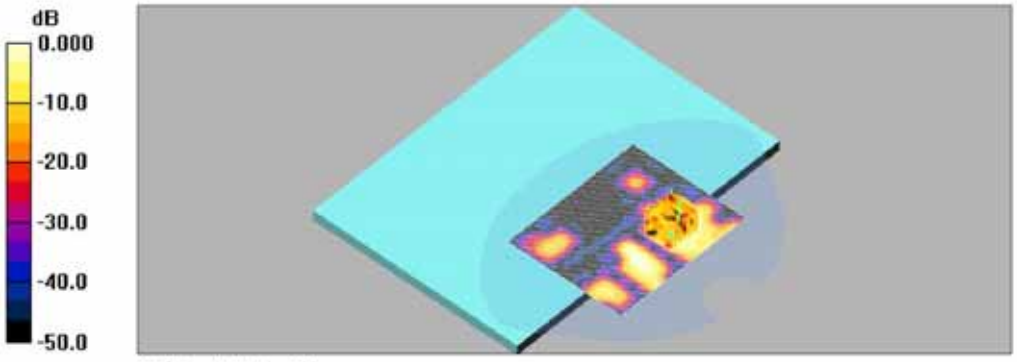
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Upper); Frequency: 5785 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5785 MHz; σ = 6.24 mho/m; ε_r = 48; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.66, 3.66, 3.66); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11a_5785 MHz_Back Screen_U-NII Upper_AUX ANT/Area Scan (81x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.173 mW/g

WLAN_11a_5785 MHz_Back Screen_U-NII Upper_AUX ANT/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.00 V/m; Power Drift = -0.043 dB
Peak SAR (extrapolated) = 0.506 W/kg
SAR(1 g) = 0.119 mW/g; SAR(10 g) = 0.048 mW/g
Maximum value of SAR (measured) = 0.124 mW/g



0 dB = 0.124mW/g

Date: 2012-01-26

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_Base_Main+AUX ANT_UNII-Upper(5745).da4

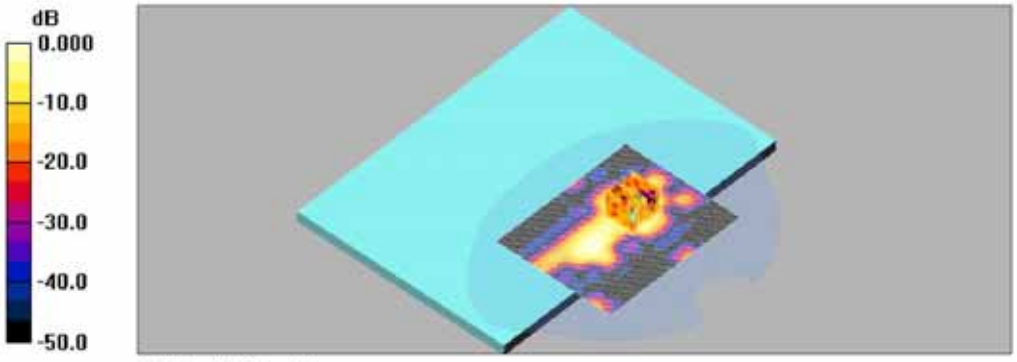
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Upper); Frequency: 5745 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5745 MHz; σ = 6.21 mho/m; ε_r = 47.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.66, 3.66, 3.66); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11a_5745 MHz_Base_U-NII Upper_Main+AUX ANT/Area Scan (81x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.244 mW/g

WLAN_11a_5745 MHz_Base_U-NII Upper_Main+AUX ANT/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.76 V/m; Power Drift = -0.018 dB
Peak SAR (extrapolated) = 0.691 W/kg
SAR(1 g) = 0.218 mW/g; SAR(10 g) = 0.072 mW/g
Maximum value of SAR (measured) = 0.284 mW/g



0 dB = 0.284mW/g

Date: 2012-01-26

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_Base_Main+AUX ANT_UNII-Upper(5755).da4

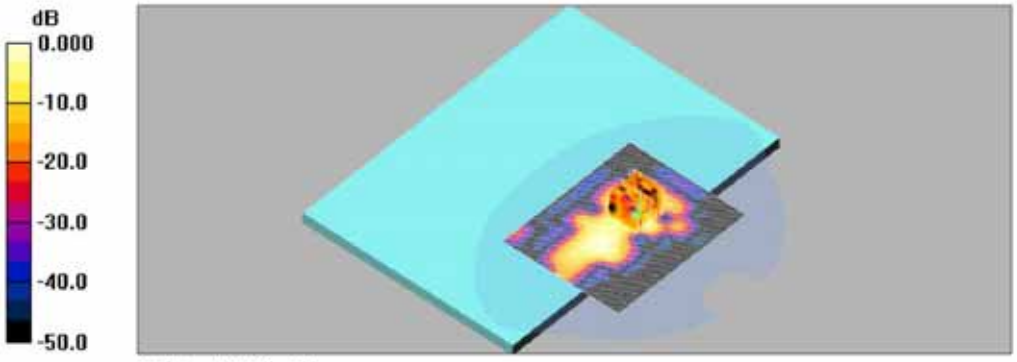
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Upper); Frequency: 5755 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5755 MHz; σ = 6.22 mho/m; ε_r = 48; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.66, 3.66, 3.66); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11a_5755 MHz_Base_U-NII Upper_Main+AUX ANT/Area Scan (81x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.286 mW/g

WLAN_11a_5755 MHz_Base_U-NII Upper_Main+AUX ANT/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.93 V/m; Power Drift = -0.099 dB
Peak SAR (extrapolated) = 0.715 W/kg
SAR(1 g) = 0.228 mW/g; SAR(10 g) = 0.076 mW/g
Maximum value of SAR (measured) = 0.303 mW/g



0 dB = 0.303mW/g

Date: 2012-01-26

Test Laboratory: SGS Korea (Gunpo Laboratory)
File Name: WLAN_Back screen_Main+AUX ANT_UNII-Upper(5755).da4

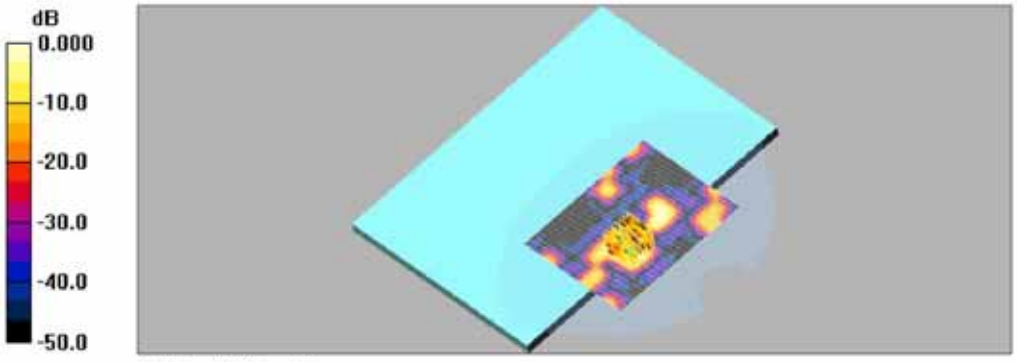
DUT: 62230ANHMW(NP900X3B); Type: Module(Note PC); Serial: HPKQ93GBC00087J
Program Name: WLAN_Body

Communication System: WLAN(11a_U-NII Upper); Frequency: 5755 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5755 MHz; σ = 6.22 mho/m; ε_r = 48; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3791; ConvF(3.66, 3.66, 3.66); Calibrated: 2011-06-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn479; Calibrated: 2011-08-29
- 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_11a_5755 MHz_Back screen_U-NII Upper_Main+AUX ANT/Area Scan (81x101x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.156 mW/g

WLAN_11a_5755 MHz_Back screen_U-NII Upper_Main+AUX ANT/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.95 V/m; Power Drift = 0.151 dB
Peak SAR (extrapolated) = 0.435 W/kg
SAR(1 g) = 0.099 mW/g; SAR(10 g) = 0.033 mW/g
Maximum value of SAR (measured) = 0.095 mW/g



0 dB = 0.095mW/g

Appendix B

Uncertainty Analysis

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	6.3	N	1	1	6.30	∞
Axial isotropy	E.2.2	0.5	R	1.73	0.71	0.20	∞
hemispherical isotropy	E.2.2	2.6	R	1.73	0.71	1.06	∞
Boundary effect	E.2.3	0.8	R	1.73	1	0.46	∞
Linearity	E.2.4	0.6	R	1.73	1	0.35	∞
System detection limit	E.2.5	0.25	R	1.73	1	0.14	∞
Readout electronics	E.2.6	0.3	N	1	1	0.30	∞
Response time	E.2.7	0	R	1.73	1	0.00	∞
Integration time	E.2.8	2.6	R	1.73	1	1.50	∞
RF ambient Condition -Noise	E.6.1	3	R	1.73	1	1.73	∞
RF ambient Condition - reflections	E.6.1	3	R	1.73	1	1.73	∞
Probe positioning- mechanical tolerance	E.6.2	1.5	R	1.73	1	0.87	∞
Probe positioning- with respect to phantom	E.6.3	2.9	R	1.73	1	1.67	∞
Max. SAR evaluation	E.5.2	1	R	1.73	1	0.58	∞
Test sample positioning	E.4.2	2.3	N	1	1	2.30	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	4	R	1.73	1	2.31	∞
Liquid conductivity - deviation from target values	E.3.2	5	R	1.73	0.64	1.85	∞
Liquid conductivity - measurement uncertainty	E.3.2	1.2	N	1	0.64	0.77	5
Liquid permittivity - deviation from target values	E.3.3	5	R	1.73	0.6	1.73	∞
Liquid permittivity - measurement uncertainty	E.3.3	1.1	N	1	0.6	0.66	5
Combined standard uncertainty				RSS		9.63	2754
Expanded uncertainty (95% CONFIDENCE INTERVAL)				K=2		19.27	

Appendix C

Calibration Certificate

- PROBE (ET3DV6, EX3DV4)

- DAE 3

- 2450 MHz / 5 GHz DIPOLE

- PROBE Calibration Certificate (ET3DV6)

Calibration Laboratory of
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Accreditation No.: SCS 108

Client SGS (Dymstec) **Certificate No: ET3-1782_Apr11**

CALIBRATION CERTIFICATE

Object: ET3DV6 - SN:1782

Calibration procedure(s): QA CAL-01.v7, QA CAL-12.v6, QA CAL-23.v4, QA CAL-25.v3
Calibration procedure for dosimetric E-field probes

Calibration date: April 14, 2011

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	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41495277	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	23-Apr-10 (No. DAE4-654_Apr10)	Apr-11
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

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

Issued: April 14, 2011

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

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Accreditation No.: SCS 108

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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

Probe ET3DV6

SN:1782

Manufactured: April 15, 2003
Calibrated: April 14, 2011

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

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	2.07	1.66	1.92	± 10.1 %
DCP (mV)[B]	96.4	96.6	97.6	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	111.1	±1.9 %
			Y	0.00	0.00	1.00	141.0	
			Z	0.00	0.00	1.00	145.1	

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

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

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	43.5	0.87	6.89	6.89	6.89	0.21	2.29	± 13.4 %
835	41.5	0.90	6.22	6.22	6.22	0.88	1.63	± 12.0 %
1750	40.1	1.37	5.14	5.14	5.14	0.57	2.53	± 12.0 %
1900	40.0	1.40	4.95	4.95	4.95	0.58	2.54	± 12.0 %
2450	39.2	1.80	4.37	4.37	4.37	0.80	1.93	± 12.0 %

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

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

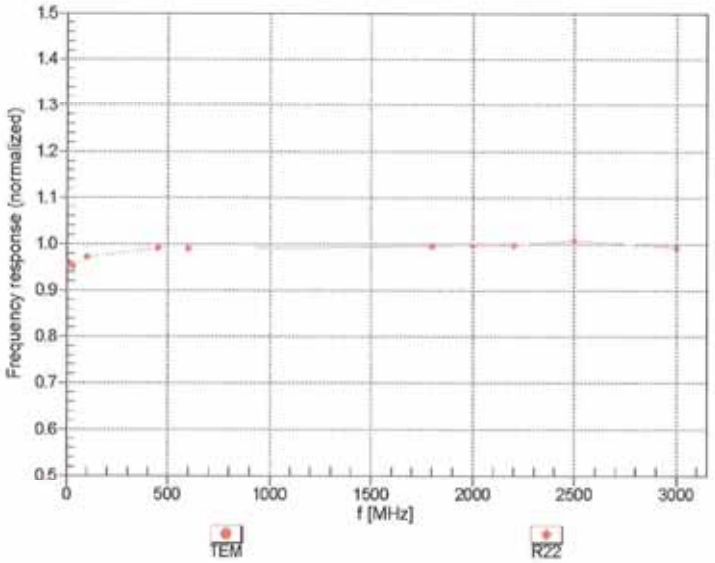
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	7.49	7.49	7.49	0.16	2.34	± 13.4 %
835	55.2	0.97	6.03	6.03	6.03	0.85	1.72	± 12.0 %
1750	53.4	1.49	4.54	4.54	4.54	0.64	2.70	± 12.0 %
1900	53.3	1.52	4.34	4.34	4.34	0.63	2.57	± 12.0 %
2450	52.7	1.95	3.94	3.94	3.94	0.99	1.21	± 12.0 %

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

ET3DV6- SN:1782 April 14, 2011

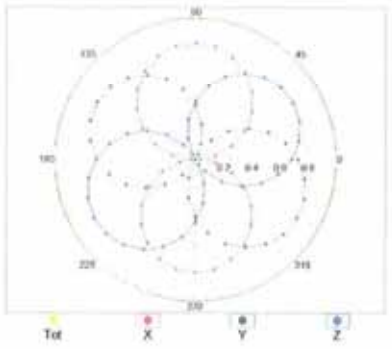
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



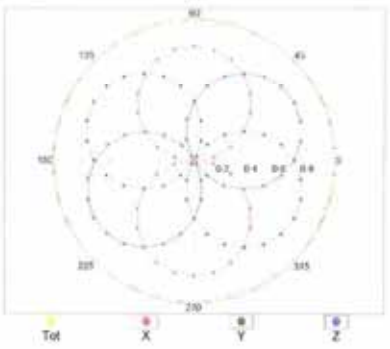
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

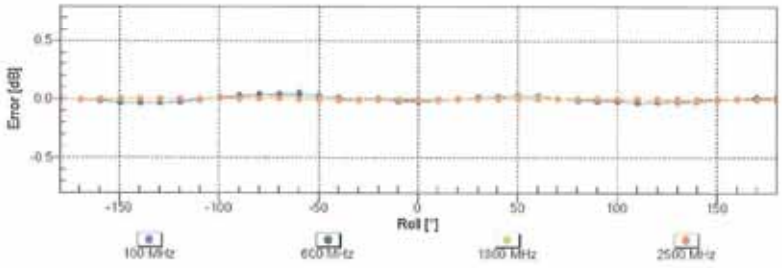
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



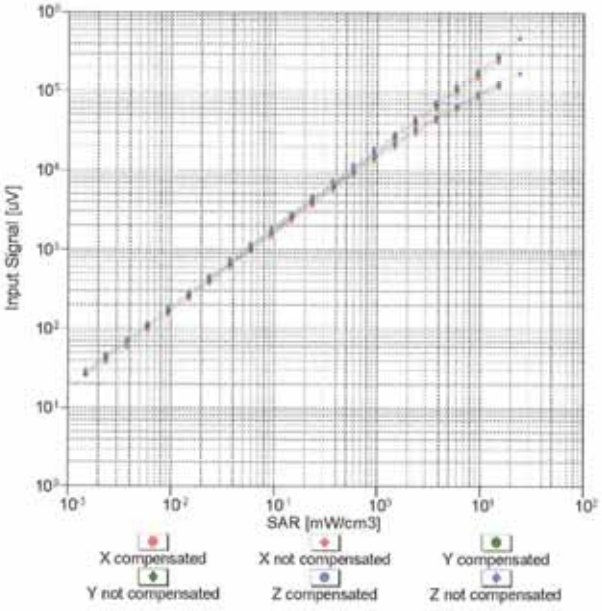
f=1800 MHz,R22

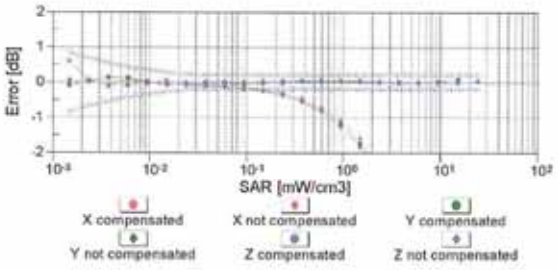




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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



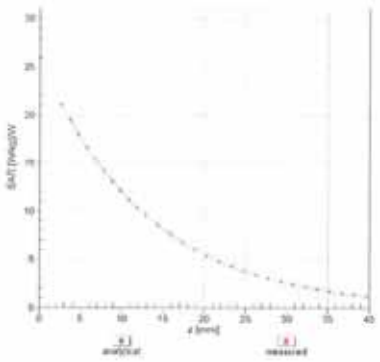


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

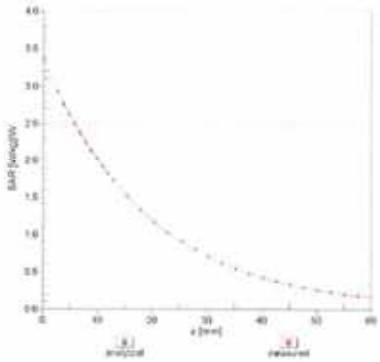
ET3DV6– SN:1782 April 14, 2011

Conversion Factor Assessment

f = 1750 MHz,WGLS R22 (H_convF)

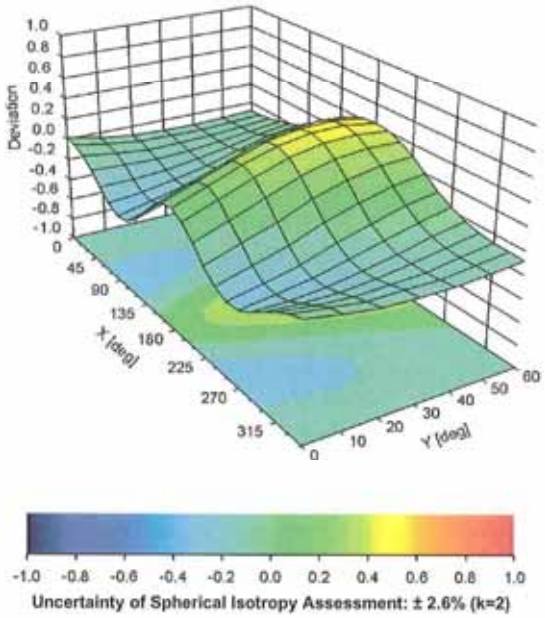


f = 835 MHz,WGLS R9 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

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

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	6.8 mm
Probe Tip to Sensor X Calibration Point	2.7 mm
Probe Tip to Sensor Y Calibration Point	2.7 mm
Probe Tip to Sensor Z Calibration Point	2.7 mm
Recommended Measurement Distance from Surface	4 mm

- PROBE Calibration Certificate (EX3DV4)

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Accreditation No.: SCS 108

Client SGS (Dymstec) **Certificate No: EX3-3791_Jun11**

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: June 21, 2011

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	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

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

Issued: June 21, 2011

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

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Accreditation No.: SCS 108

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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

Probe EX3DV4

SN:3791

Manufactured: February 18, 2011
Calibrated: June 21, 2011

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

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.51	0.56	0.55	± 10.1 %
DCP (mV)[B]	103.5	101.7	100.4	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	120.9	±1.9 %
			Y	0.00	0.00	1.00	121.4	
			Z	0.00	0.00	1.00	126.5	

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

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

DASY/EASY - Parameters of Probe: 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	6.41	6.41	6.41	0.63	0.72	± 12.0 %
3700	37.7	3.12	5.88	5.88	5.88	0.35	1.09	± 13.1 %
5200	36.0	4.66	4.61	4.61	4.61	0.40	1.80	± 13.1 %
5300	35.9	4.76	4.43	4.43	4.43	0.40	1.80	± 13.1 %
5500	35.6	4.96	4.39	4.39	4.39	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.07	4.07	4.07	0.45	1.80	± 13.1 %
5800	35.3	5.27	4.13	4.13	4.13	0.45	1.80	± 13.1 %

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

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

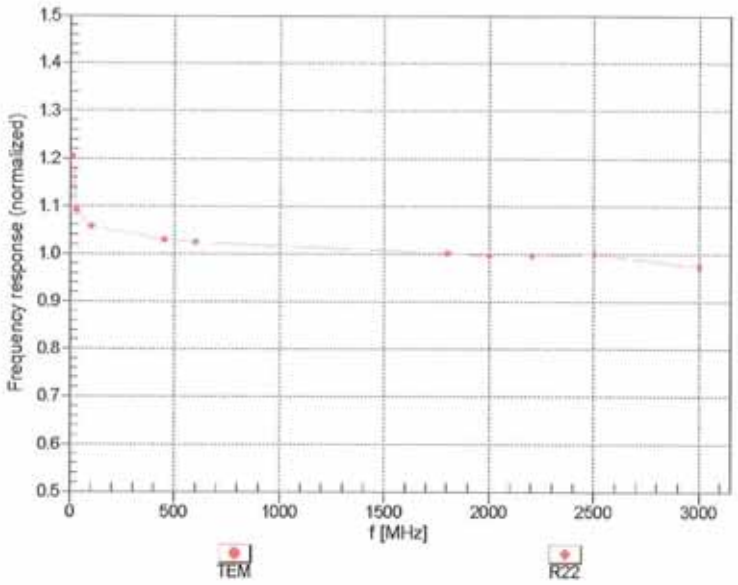
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz)[C]	Relative Permittivity[F]	Conductivity (S/m)[F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
2600	52.5	2.16	6.32	6.32	6.32	0.79	0.60	± 12.0 %
3700	51.0	3.55	5.76	5.76	5.76	0.31	1.43	± 13.1 %
5200	49.0	5.30	3.96	3.96	3.96	0.55	1.90	± 13.1 %
5300	48.9	5.42	3.79	3.79	3.79	0.55	1.90	± 13.1 %
5500	48.6	5.65	3.48	3.48	3.48	0.60	1.90	± 13.1 %
5600	48.5	5.77	3.26	3.26	3.26	0.60	1.90	± 13.1 %
5800	48.2	6.00	3.66	3.66	3.66	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 June 21, 2011

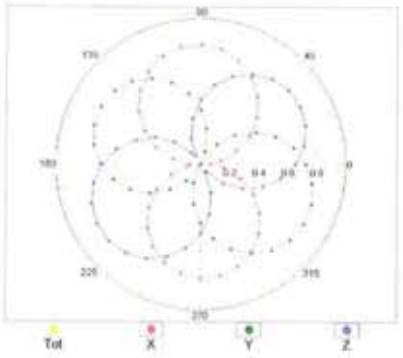
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



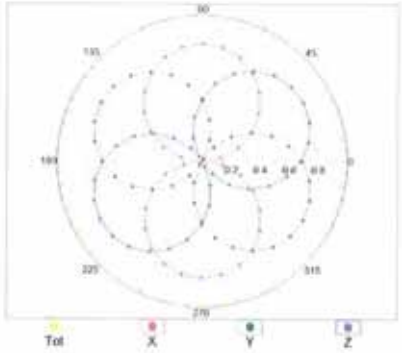
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

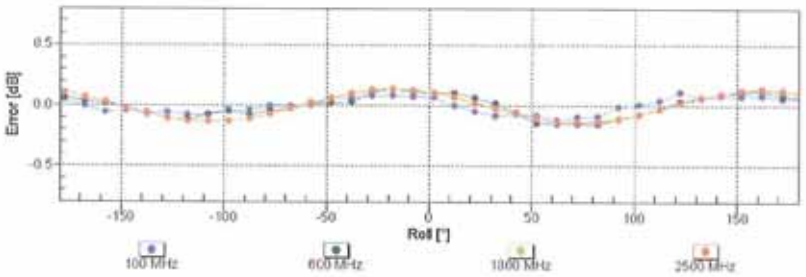
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



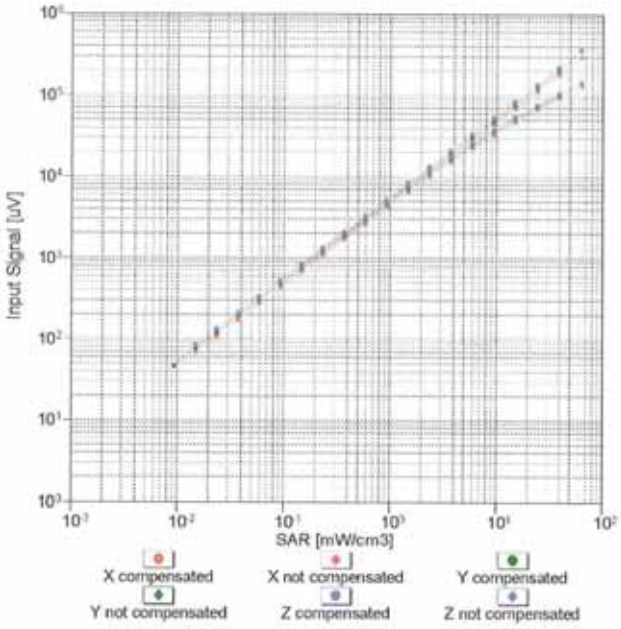
f=1800 MHz,R22

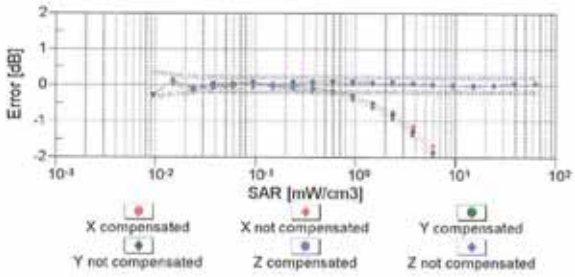




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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



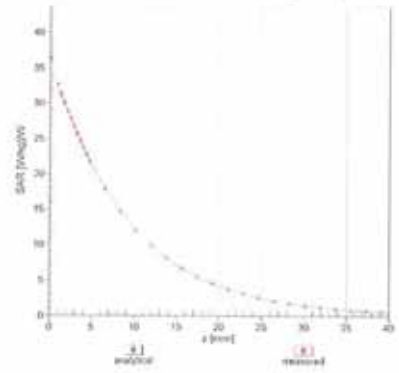


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

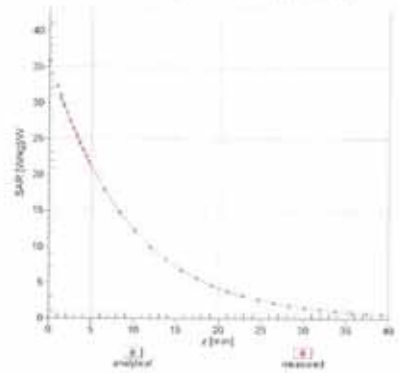
EX3DV4– SN:3791 June 21, 2011

Conversion Factor Assessment

f = 2600 MHz,WGLS R22 (H_convF)

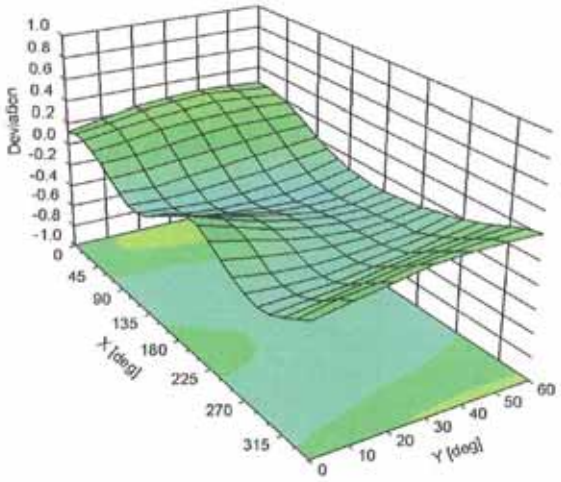


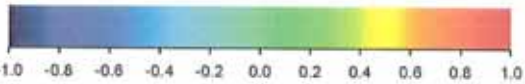
f = 2600 MHz,WGLS R22 (M_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





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

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

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

-DAE 3 Calibration Certificate

Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland

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Client Dymstec

Certificate No: DAE3-479_Aug11

CALIBRATION CERTIFICATE

Object	DAE3 - SD 000 D03 BJ - SN: 479
Calibration procedure(s)	QA CAL-06.v23 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	August 29, 2011

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	28-Sep-10 (No:10376)	Sep-11
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Calibrator Box V1.1	SE UMS 006 AB 1004	08-Jun-11 (in house check)	In house check: Jun-12

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

Issued: August 29, 2011

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

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

Methods Applied and Interpretation of Parameters

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

DC Voltage Measurement

A/D - Converter Resolution nominal

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

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

Calibration Factors	X	Y	Z
High Range	403.335 ± 0.1% (k=2)	404.663 ± 0.1% (k=2)	404.429 ± 0.1% (k=2)
Low Range	3.96166 ± 0.7% (k=2)	3.96051 ± 0.7% (k=2)	3.96781 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	71.5 ° ± 1 °

Appendix

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	200001.1	-1.15	-0.00
Channel X	+ Input	20000.71	0.51	0.00
Channel X	- Input	-19997.07	2.83	-0.01
Channel Y	+ Input	199999.0	-2.17	-0.00
Channel Y	+ Input	19994.57	-5.43	-0.03
Channel Y	- Input	-20001.85	-2.15	0.01
Channel Z	+ Input	200000.9	0.60	0.00
Channel Z	+ Input	19997.56	-3.14	-0.02
Channel Z	- Input	-19999.90	0.80	-0.00

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	1999.8	-0.23	-0.01
Channel X	+ Input	199.86	0.16	0.08
Channel X	- Input	-200.29	-0.39	0.19
Channel Y	+ Input	1999.7	-0.29	-0.01
Channel Y	+ Input	199.31	-0.69	-0.35
Channel Y	- Input	-201.78	-1.78	0.89
Channel Z	+ Input	1999.9	-0.21	-0.01
Channel Z	+ Input	199.27	-0.63	-0.32
Channel Z	- Input	-200.76	-0.76	0.38

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	18.40	16.77
	- 200	-15.99	-17.76
Channel Y	200	7.13	6.81
	- 200	-8.07	-8.70
Channel Z	200	-7.24	-7.73
	- 200	6.67	6.51

3. Channel separation

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

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	1.88	-1.20
Channel Y	200	2.40	-	4.80
Channel Z	200	1.65	-1.03	-

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	15757	16312
Channel Y	16204	17522
Channel Z	15654	16295

5. Input Offset Measurement

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

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.03	-1.50	3.01	0.68
Channel Y	-0.72	-2.15	0.78	0.66
Channel Z	-0.59	-1.29	0.70	0.38

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 ㎒ Dipole Calibration Certificate

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Accreditation No.: SCS 108

Client SGS (Dymstec)

Certificate No: D2450V2-734_May10

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 734
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	May 27, 2010

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	06-Oct-09 (No. 217-01086)	Oct-10
Power sensor HP 8481A	US37292783	06-Oct-09 (No. 217-01086)	Oct-10
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	02-Mar-10 (No. DAE4-601_Mar10)	Mar-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-09)	In house check: Oct-10

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 27, 2010

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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.

Measurement Conditions

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

DASY Version	DASY5	V5.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
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	39.0 ± 6 %	1.76 mho/m ± 6 %
Head TSL temperature during test	(21.5 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	12.8 mW / g
SAR normalized	normalized to 1W	51.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**51.7 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.03 mW / g
SAR normalized	normalized to 1W	24.1 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**24.2 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	53.6 ± 6 %	1.97 mho/m ± 6 %
Body TSL temperature during test	(21.8 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.4 mW / g
SAR normalized	normalized to 1W	53.6 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**53.5 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.31 mW / g
SAR normalized	normalized to 1W	25.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**25.2 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.8 Ω + 3.2 jΩ
Return Loss	- 26.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.8 Ω + 4.4 jΩ
Return Loss	- 27.1 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.
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/Time: 25.05.2010 14:48:31

Test Laboratory: SPEAG, Zurich, Switzerland

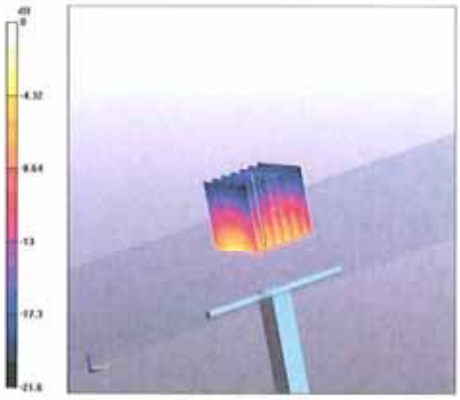
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:734

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL U11 BB
Medium parameters used: f = 2450 MHz; σ = 1.76 mho/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

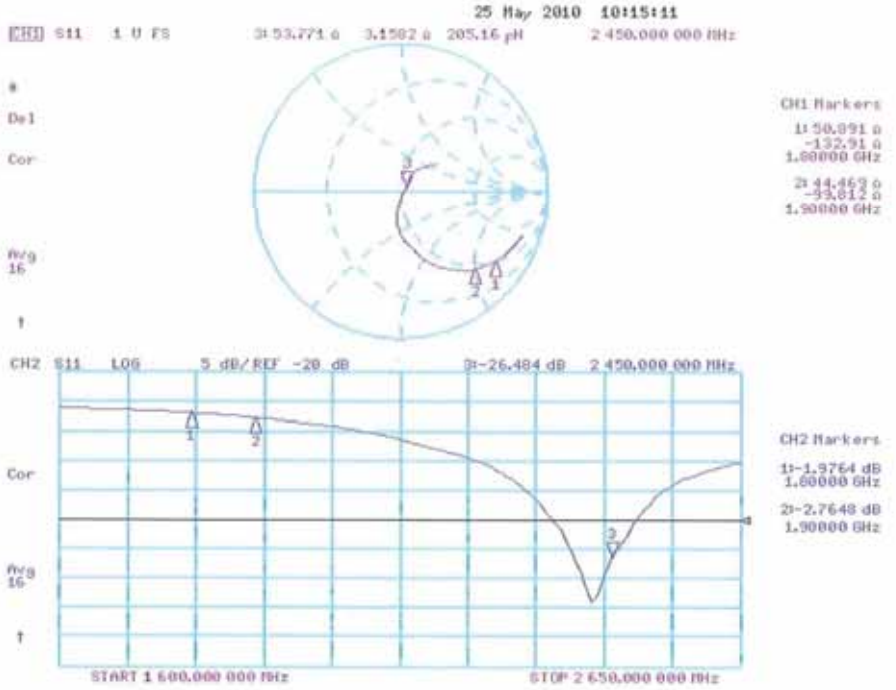
- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.03.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 101.2 V/m; Power Drift = 0.030 dB
Peak SAR (extrapolated) = 26.1 W/kg
SAR(1 g) = 12.8 mW/g; SAR(10 g) = 6.03 mW/g
Maximum value of SAR (measured) = 16.7 mW/g



0 dB = 16.7mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body

Date/Time: 27.05.2010 10:14:45

Test Laboratory: SPEAG, Zurich, Switzerland

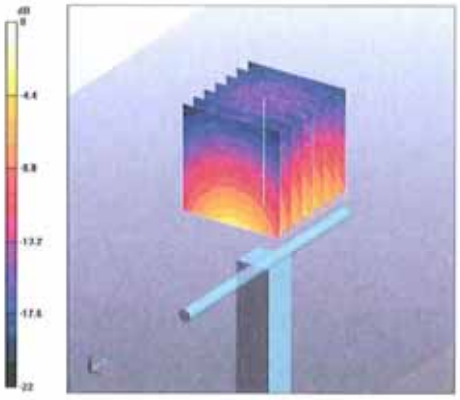
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:734

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: MSL U11 BB
Medium parameters used: f = 2450 MHz; σ = 1.97 mho/m; ε_r = 53.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

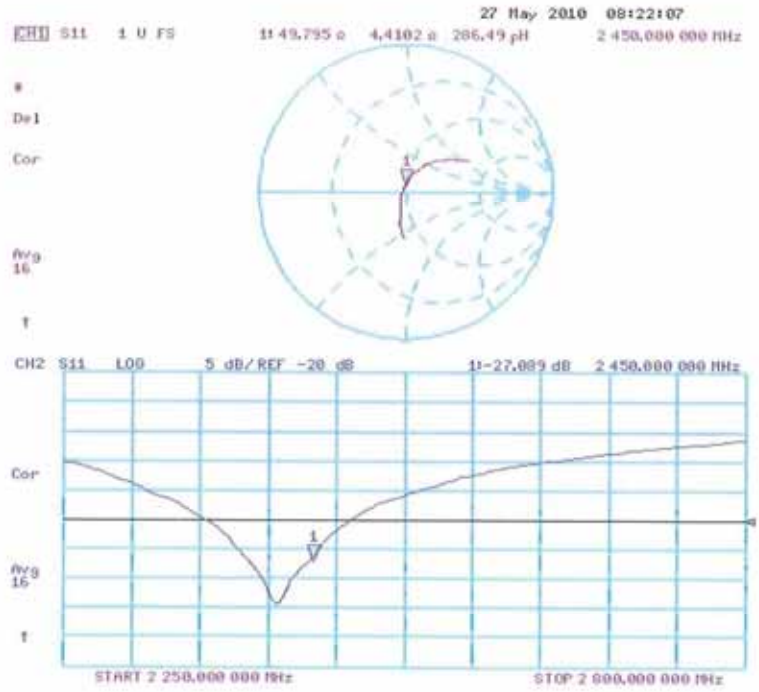
- Probe: ES3DV3 - SN3205; ConvF(4.31, 4.31, 4.31); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.03.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.7 V/m; Power Drift = -0.030 dB
Peak SAR (extrapolated) = 27.3 W/kg
SAR(1 g) = 13.4 mW/g; SAR(10 g) = 6.31 mW/g
Maximum value of SAR (measured) = 17.4 mW/g



0 dB = 17.4mW/g

Impedance Measurement Plot for Body TSL



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

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Accreditation No.: **SCS 108**

Client **SGS (Dymstec)** Certificate No: **D5GHz-1106_Jun11**

CALIBRATION CERTIFICATE

Object	D5GHzV2 - SN: 1106
Calibration procedure(s)	QA CAL-22.v1 Calibration procedure for dipole validation kits between 3-6 GHz
Calibration date:	June 21, 2011

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	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 5086 (20g)	29-Mar-11 (No. 217-01368)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe EX3DV4	SN: 3503	04-Mar-11 (No. EX3-3503_Mar11)	Mar-12
DAE4	SN: 601	8-Jun-11 (No. DAE4-601_Jun11)	Jun-12

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: June 21, 2011

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

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Accredited by the Swiss Accreditation Service (SAS)
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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.

Measurement Conditions

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

DASY Version	DASY5	V52.6.2
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	
Frequency	5200 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	35.8 ± 6 %	4.50 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.23 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**82.2 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.34 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**23.3 mW /g ± 16.5 % (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 %	5.08 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.09 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**80.5 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.30 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**22.9 mW / g ± 16.5 % (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	49.0 ± 6 %	5.41 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.58 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**75.8 mW / g ± 18.1 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.12 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.2 mW / g ± 17.6 % (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	47.8 ± 6 %	6.21 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.66 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**76.5 mW / g ± 18.1 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.12 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.2 mW / g ± 17.6 % (k=2)**

Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	52.9 Ω - 9.8 jΩ
Return Loss	- 20.1 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	52.7 Ω - 6.9 jΩ
Return Loss	- 22.8 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	49.6 Ω - 9.3 jΩ
Return Loss	- 20.6 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	55.5 Ω + 0.9 jΩ
Return Loss	- 25.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 11, 2011

DASY5 Validation Report for Head TSL

Date: 20.06.2011

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHz; Serial: D5GHzV2 - SN: 1106

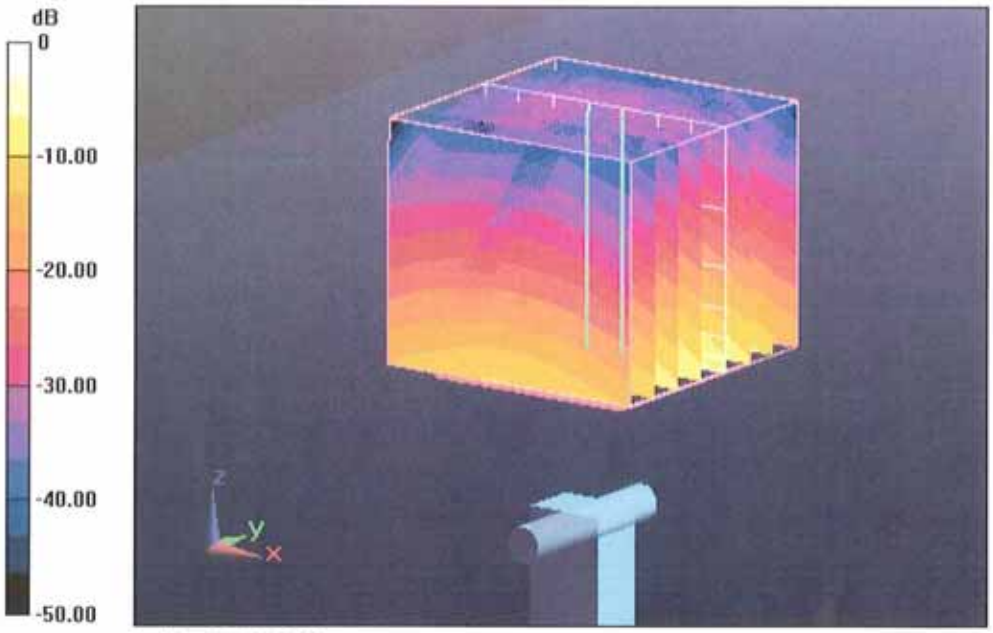
Communication System: CW; Frequency: 5200 MHz, Frequency: 5800 MHz
Medium: HSL 502 A
Medium parameters used: f = 5200 MHz; σ = 4.5 mho/m; ε_r = 35.8; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 5.08 mho/m; ε_r = 34.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.41, 5.41, 5.41), ConvF(4.81, 4.81, 4.81); Calibrated: 04.03.2011
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 08.06.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

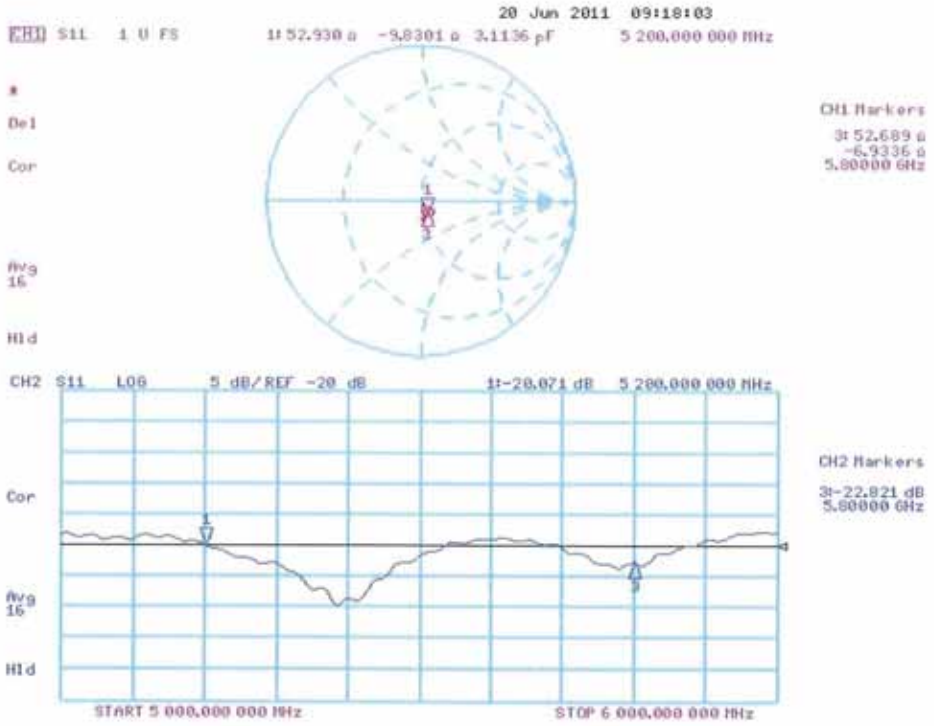
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.231 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 30.485 W/kg
SAR(1 g) = 8.23 mW/g; SAR(10 g) = 2.34 mW/g
Maximum value of SAR (measured) = 18.450 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 = 62.792 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 33.712 W/kg
SAR(1 g) = 8.09 mW/g; SAR(10 g) = 2.3 mW/g
Maximum value of SAR (measured) = 19.009 mW/g



0 dB = 19.010mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 21.06.2011

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHz; Serial: D5GHzV2 - SN: 1106

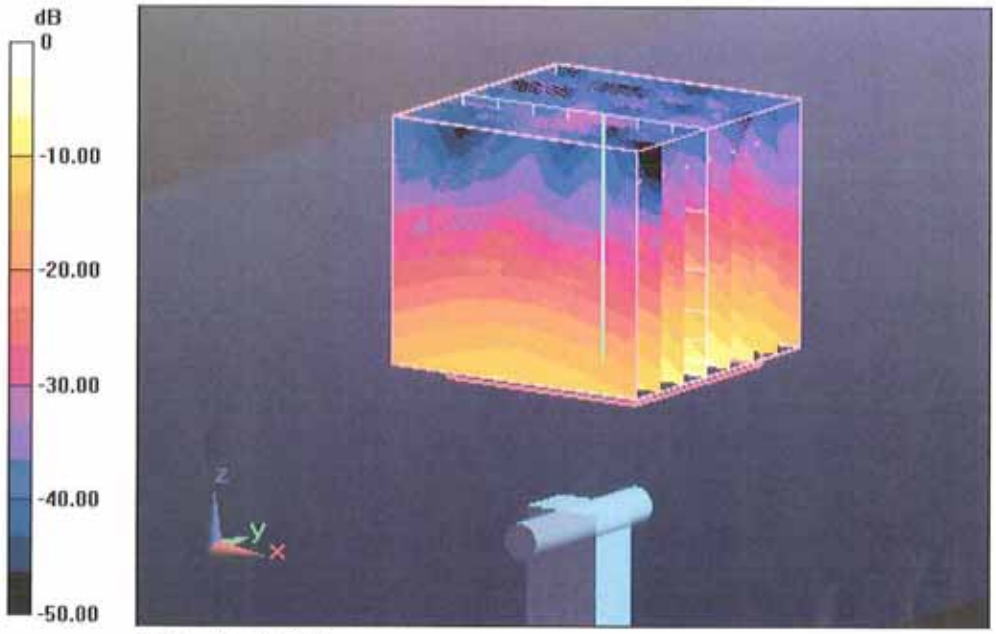
Communication System: CW; Frequency: 5200 MHz, Frequency: 5800 MHz
Medium: MSL 501
Medium parameters used: f = 5200 MHz; σ = 5.41 mho/m; ε_r = 49; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 6.21 mho/m; ε_r = 47.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.91, 4.91, 4.91), ConvF(4.38, 4.38, 4.38); Calibrated: 04.03.2011
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 08.06.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

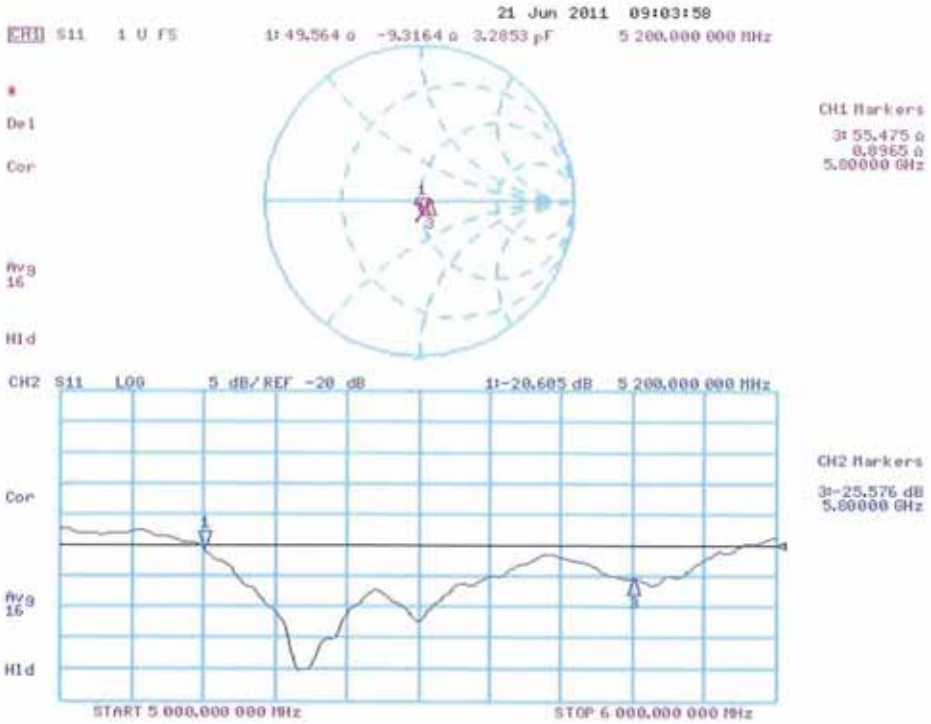
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 59.327 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 29.350 W/kg
SAR(1 g) = 7.58 mW/g; SAR(10 g) = 2.12 mW/g
Maximum value of SAR (measured) = 17.624 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 = 56.058 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 35.029 W/kg
SAR(1 g) = 7.66 mW/g; SAR(10 g) = 2.12 mW/g
Maximum value of SAR (measured) = 18.810 mW/g



0 dB = 18.810mW/g

Impedance Measurement Plot for Body TSL



-5 GHz Dipole Calibration Certificate (5.5 GHz)

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
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: D5GHzV2-1106_Nov11

CALIBRATION CERTIFICATE

Object	D5GHzV2 - SN: 1106
Calibration procedure(s)	QA CAL-22.v1 Calibration procedure for dipole validation kits between 3-6 GHz
Calibration date:	November 15, 2011

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5086 (20g)	29-Mar-11 (No. 217-01368)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe EX3DV4	SN: 3503	04-Mar-11 (No. EX3-3503_Mar11)	Mar-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

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

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: November 17, 2011

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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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
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.

Measurement Conditions

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

DASY Version	DASY5	V52.6.2
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	5500 MHz ± 1 MHz	

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	34.2 ± 6 %	4.75 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.88 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**87.9 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.52 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**24.9 mW / g ± 16.5 % (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	47.2 ± 6 %	5.87 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.21 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**81.7 mW / g ± 18.1 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.27 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**22.6 mW / g ± 17.6 % (k=2)**

Appendix

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	50.7 Ω - 3.2 jΩ
Return Loss	- 29.6 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	50.8 Ω - 1.9 jΩ
Return Loss	- 33.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 11, 2011

DASY5 Validation Report for Head TSL

Date: 15.11.2011

Test Laboratory: SPEAG, Zurich, Switzerland

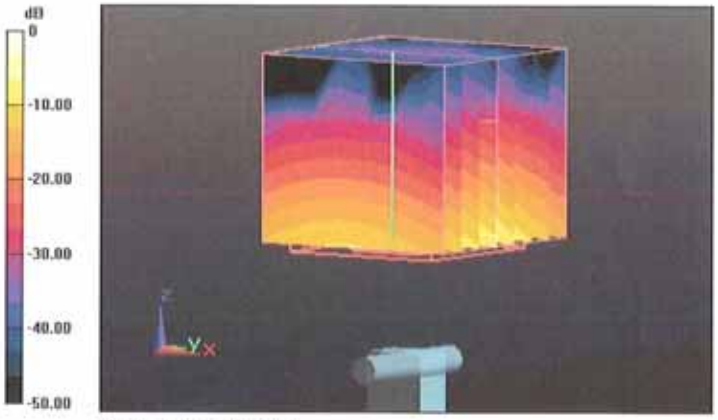
DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1106

Communication System: CW; Frequency: 5500 MHz
Medium parameters used: f = 5500 MHz; σ = 4.75 mho/m; ε_r = 34.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

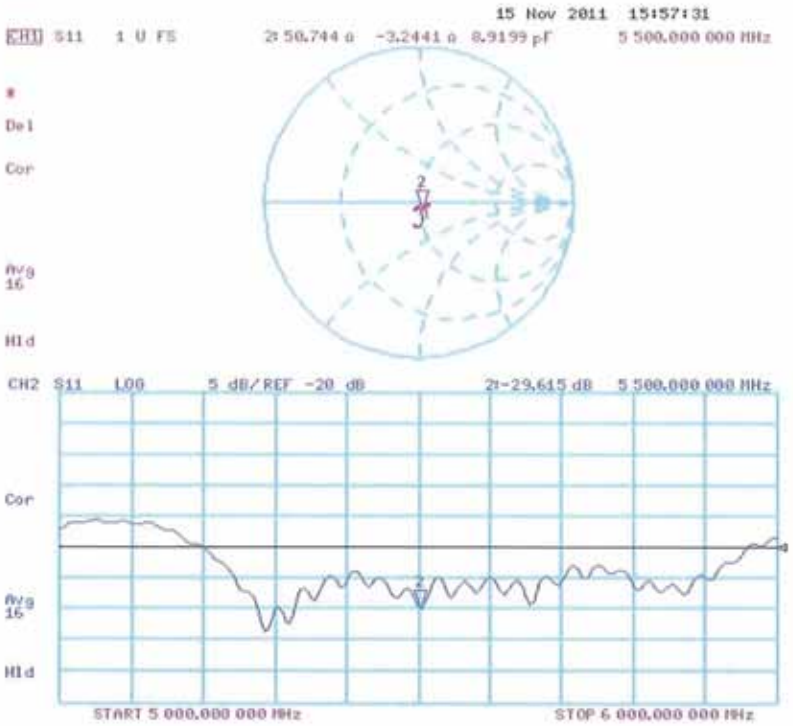
- Probe: EX3DV4 - SN3503; ConvF(4.91, 4.91, 4.91); Calibrated: 04.03.2011
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

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 = 66.617 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 35.293 W/kg
SAR(1 g) = 8.88 mW/g; SAR(10 g) = 2.52 mW/g
Maximum value of SAR (measured) = 21.227 mW/g



0 dB = 21.230mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 14.11.2011

Test Laboratory: SPEAG, Zurich, Switzerland

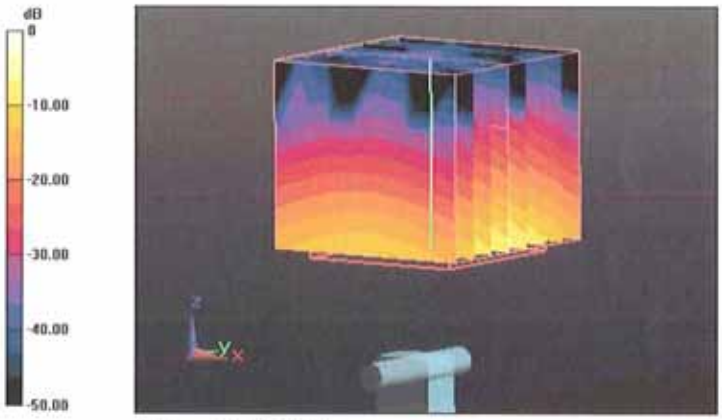
DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1106

Communication System: CW; Frequency: 5500 MHz
Medium parameters used: f = 5500 MHz; σ = 5.87 mho/m; ε_r = 47.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

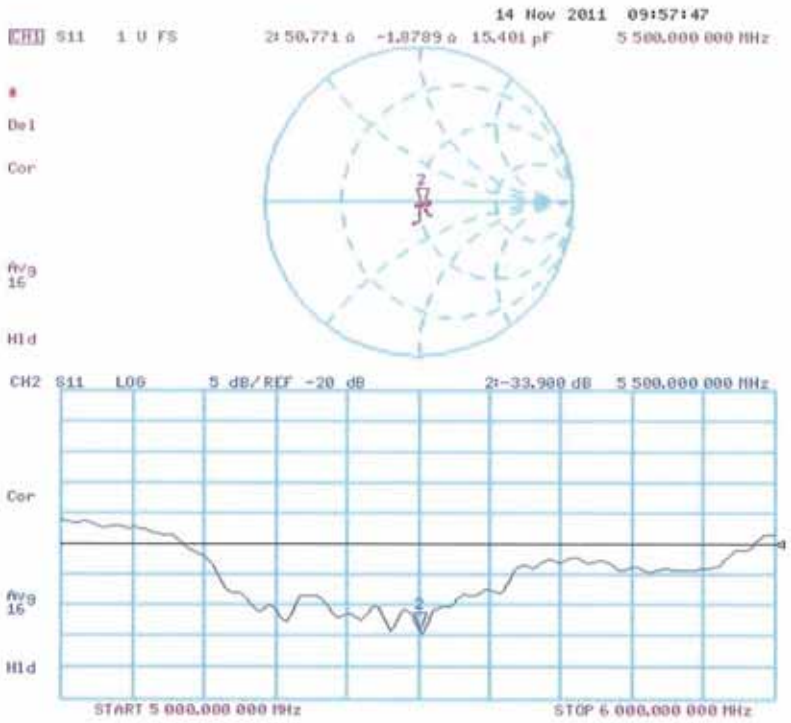
- Probe: EX3DV4 - SN3503; ConvF(4.43, 4.43, 4.43); Calibrated: 04.03.2011
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

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 = 59.363 V/m; Power Drift = -0.0064 dB
Peak SAR (extrapolated) = 35.196 W/kg
SAR(1 g) = 8.21 mW/g; SAR(10 g) = 2.27 mW/g
Maximum value of SAR (measured) = 19.467 mW/g



0 dB = 19.470mW/g

Impedance Measurement Plot for Body TSL



-THE END-