

# SAR TEST REPORT

Equipment Under Test	POS terminal
Model Name	IPA280-01P1802
Mode of Operation	GSM/GPRS/WLAN 802.11 b/g band
Company Name	INGENICO
Company Address	192, avenue Charles de Gaulle, 92200 Neuilly-sur-Seine, FRANCE
Date of Receipt	2011.07.25
Date of Test(s)	2011.09.24 , 2011.09.26
Date of Issue	2012.03.03

Standards:

**FCC OET Bulletin 65 supplement C,  
IEEE/ANSI C95.1, C95.3, IEEE 1528  
RSS-102**


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.

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Tested by : Chris Tsung  Date : 2012.03.03  
Engineer

Approved by : Kelly Tsai  Date : 2012.03.03  
Supervisor

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## Version

Report Number	Revision	Date	Memo
EN/2011/70017	00	2012/01/05	Initial creation of test report.
EN/2011/70017	01	2012/02/17	1 <sup>st</sup> modification.
EN/2011/70017	02	2012/03/03	2 <sup>nd</sup> modification

**This test report contains a reference to the previous version test report that it replaces.**

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# 1. General Information

## 1.1 Testing Laboratory

SGS Taiwan Ltd. Electronics & Communication Laboratory	
134, Wu Kung Road, Wuku industrial zone	
Taipei county, Taiwan, R.O.C.	
Telephone	+886-2-2299-3279
Fax	+886-2-2298-0488
Internet	http://www.tw.sgs.com/

Testing Location	1F, No.8, Alley 15, Lane 120, Sec .1, NeiHu Road NeiHu District Taipei City 114, Taiwan
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## 1.2 Details of Applicant

Company Name	INGENICO
Company Address	192, avenue Charles de Gaulle, 92200 Neuilly-sur-Seine, FRANCE
Contact Person	Roger DEVORNIQUE / Product Manager
TEL	+33 (0) 4 75 60 22 88
E-mail	marc.delorme@ingenico.com

## 1.3 Description of EUT

EUT Name	POS terminal
Model Name	IPA280-01P1802
Brand Name	INGENICO
IMEI code	352421041675994

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FCC ID	XKBIPA280NEWMODEM			
Definition	Production unit			
Mode of Operation	GSM/GPRS/ WLAN 802.11 b/g band			
Duty Cycle	GSM	GPRS (2multi-slot)	WLAN 802.11 b/g	
	1/8	1/4.1	1	
TX Frequency range (MHz)	GSM 850	GPRS 850	GSM 1900	GPRS 1900
	824.2-848.8	824.2-848.8	1850.2-1909.8	1850.2-1909.8
	WLAN802.11 b	WLAN802.11 g	/	
	2412-2462	2412-2462		
Channel Number (ARFCN)	GSM 850	GPRS 850	GSM 1900	GPRS 1900
	128-251	128-251	512-810	512-810
	WLAN802.11 b	WLAN802.11 g	/	
	1-11	1-11		
Max. SAR Measured (1g/10g)	<b>WWAN</b>			
	Head		Body	
	<b>0.097 mW/g</b> (At GSM 850 Right head cheek_CH251_repeated with Memory card)		<b>1.05 mW/g</b> (At GPRS 1900 Body_Back side_CH810_(2multi-slot))	
	<b>WLAN</b>			
<b>0.019 mW/g</b> (At WLAN802.11 b Body_Front side_CH6_repeated with Memory card)				

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**#. Conducted power table:**

Burst average power				
EUT mode	Frequency (MHz)	CH	Peak (dBm)	Avg. (dBm)
GSM 850	824.2	128	32.70	32.50
	836.6	190	32.60	32.40
	848.8	251	32.40	32.30
The division factor compared to the number of TX time slot				
			1 TX time slot	
Division factor			-9.03	
Source-based time average power				
EUT mode	Frequency (MHz)	CH	Peak (dBm)	Avg. (dBm)
GSM 850	824.2	128	23.67	23.47
	836.6	190	23.57	23.37
	848.8	251	23.37	23.27

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Burst average power						
			1Dn1UP Multi- class 8		1Dn2UP Multi- class 10	
EUT mode	Frequency (MHz)	CH	Peak (dBm)	Avg. (dBm)	Peak (dBm)	Avg. (dBm)
GPRS 850	824.2	128	32.70	32.50	32.60	32.70
	836.6	190	32.50	32.40	32.60	32.40
	848.8	251	32.40	32.30	32.40	32.30
The division factor compared to the number of TX time slot						
			1 TX time slot		2 TX time slot	
Division factor			-9.03		-6.02	
Source-based time average powe						
			1Dn1UP Multi- class 8		1Dn2UP Multi- class 10	
EUT mode	Frequency (MHz)	CH	Peak (dBm)	Avg. (dBm)	Peak (dBm)	Avg. (dBm)
GPRS 850	824.2	128	23.67	23.47	26.58	26.68
	836.6	190	23.47	23.37	26.58	26.38
	848.8	251	23.37	23.27	26.38	26.28

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Burst average power						
			1Dn1UP Multi- class 8		1Dn2UP Multi- class 10	
EUT mode	Frequency (MHz)	CH	Peak (dBm)	Avg. (dBm)	Peak (dBm)	Avg. (dBm)
EGPRS 850	824.2	128	29.60	26.30	30.10	26.80
	836.6	190	29.70	26.40	30.10	26.90
	848.8	251	29.70	26.60	30.20	27.00
The division factor compared to the number of TX time slot						
			1 TX time slot		2 TX time slot	
Division factor			-9.03		-6.02	
Source-based time average power						
			1Dn1UP Multi- class 8		1Dn2UP Multi- class 10	
EUT mode	Frequency (MHz)	CH	Peak (dBm)	Avg. (dBm)	Peak (dBm)	Avg. (dBm)
EGPRS 850	824.2	128	20.57	17.27	24.08	20.78
	836.6	190	20.67	17.37	24.08	20.88
	848.8	251	20.67	17.57	24.18	20.98

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Burst average power				
EUT mode	Frequency (MHz)	CH	Peak (dBm)	Avg. (dBm)
GSM 1900	1850.2	512	28.40	28.30
	1880	661	28.40	28.20
	1909.8	810	28.40	28.30
The division factor compared to the number of TX time slot				
			1 TX time slot	
Division factor			-9.03	
Source-based time average power				
EUT mode	Frequency (MHz)	CH	Peak (dBm)	Avg. (dBm)
GSM 1900	1850.2	512	19.37	19.27
	1880	661	19.37	19.17
	1909.8	810	19.37	19.27

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Burst average power						
			1Dn1UP Multi- class 8		1Dn2UP Multi- class 10	
EUT mode	Frequency (MHz)	CH	Peak (dBm)	Avg. (dBm)	Peak (dBm)	Avg. (dBm)
GPRS 1900	1850.2	512	28.00	27.90	28.30	24.40
	1880	661	28.20	28.10	28.30	24.50
	1909.8	810	28.40	28.30	28.40	24.30
The division factor compared to the number of TX time slot						
			1 TX time slot		2 TX time slot	
Division factor			-9.03		-6.02	
Source-based time average power						
			1Dn1UP		1Dn2UP	
EUT mode	Frequency (MHz)	CH	Peak (dBm)	Avg. (dBm)	Peak (dBm)	Avg. (dBm)
GPRS 1900	1850.2	512	18.97	18.87	22.28	18.38
	1880	661	19.17	19.07	22.28	18.48
	1909.8	810	19.37	19.27	22.38	18.28

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Burst average power						
			1Dn1UP Multi- class 8		1Dn2UP Multi- class 10	
EUT mode	Frequency (MHz)	CH	Peak (dBm)	Avg. (dBm)	Peak (dBm)	Avg. (dBm)
EGPRS 1900	1850.2	512	28.00	24.70	27.70	24.40
	1880	661	27.90	24.80	27.60	24.50
	1909.8	810	27.80	24.60	27.60	24.30
The division factor compared to the number of TX time slot						
			1 TX time slot		2 TX time slot	
Division factor			-9.03		-6.02	
Source-based time average powe						
			1Dn1UP Multi- class 8		1Dn2UP Multi- class 10	
EUT mode	Frequency (MHz)	CH	Peak (dBm)	Avg. (dBm)	Peak (dBm)	Avg. (dBm)
EGPRS 1900	1850.2	512	18.97	15.67	21.68	18.38
	1880	661	18.87	15.77	21.58	18.48
	1909.8	810	18.77	15.57	21.58	18.28

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EUT Mode	Frequency	CH	Peak Power	AVG. Power
	(MHz)		(dBm)	(dBm)
WLAN 802.11 b	2412	1	14.67	12.16
	2437	6	14.56	11.92
	2462	11	14.83	12.06
WLAN 802.11 g	2412	1	15.88	12.11
	2437	6	16.02	13.04
	2462	11	16.26	12.84

# According to **KDB447498**-When the maximum output power variation across H, M and L channels is  $\leq \frac{1}{2}$  dB, start with the middle channel; otherwise, start with the highest output power channel. When the measured 1-g SAR for the middle or highest output power channel is  $\leq 0.8$  W/kg, testing of the remaining two channels in that device and exposure configuration is not necessary.

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## 1.4 Test Environment

Ambient Temperature :  $22\pm 2^{\circ}\text{C}$

Tissue Simulating Liquid:  $22\pm 2^{\circ}\text{C}$

## 1.5 Operation description

### General:

1. The EUT is controlled by using a Radio Communication Tester (Agilent 8960), and the communication between the EUT and the tester is established by air link.
2. Measurements are performed respectively on the lowest, middle and highest channels of the operating band(s). The EUT is set to maximum power level during all tests, and at the beginning of each test the battery is fully charged.
3. During the SAR testing, the DASY5 system checks power drift by comparing the e-field strength of one specific location measured at the beginning with that measured at the end of the SAR testing.
4. Testing Head SAR at lowest, middle and highest channel for all bands with LET/LEC/RET/REC conditions.
5. Testing body-worn SAR by separating **1.5cm** between the back of the EUT and the flat phantom in GPRS mode.
6. Testing body-worn SAR by separating **1.5cm** between the front of the EUT and the flat phantom in WLAN mode.

### Additional configuration(Head):

7. For highest SAR configuration in this band repeated with external Memory card inside.

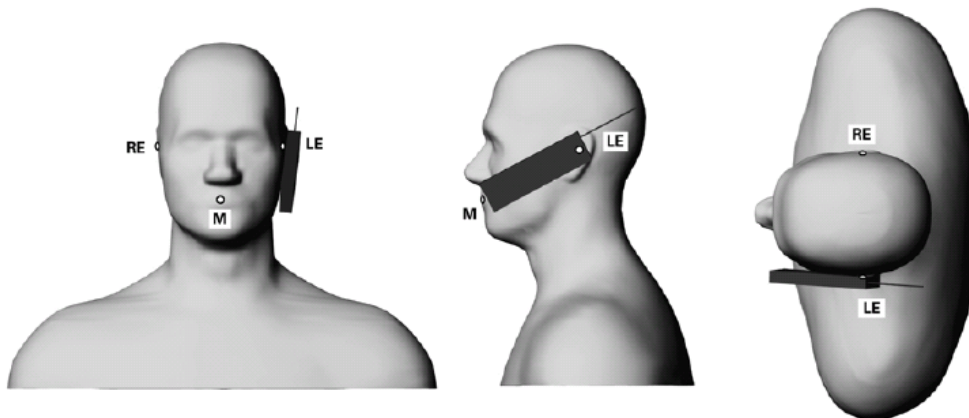
### Additional configuration(Body):

8. Testing body-worn SAR with Bluetooth transmitter OFF by separating **1.5cm** between the front of the EUT and the flat phantom in GPRS mode.
9. Testing body-worn SAR with Bluetooth transmitter OFF by separating **1.5cm** between the back of the EUT and the flat phantom in WLAN mode.

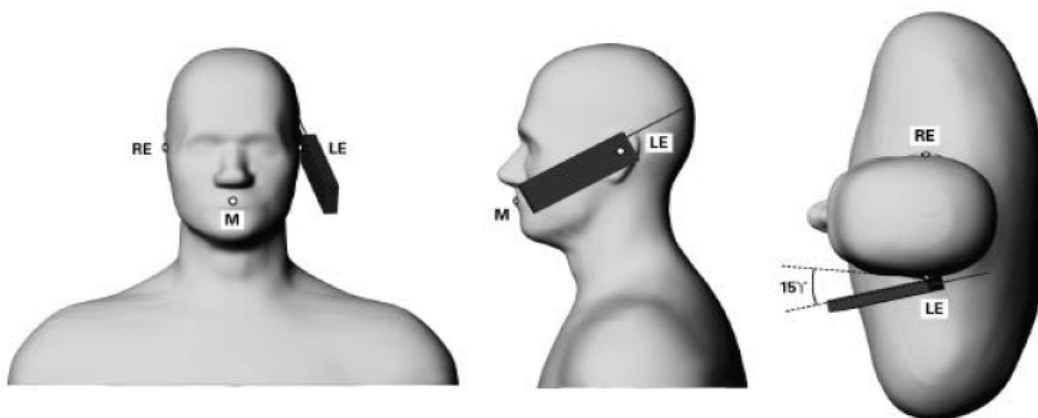
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10. For highest SAR configuration in this band repeated with external Memory card inside.
11. When the maximum transmitter and antenna output power are  $\leq 60/f(\text{GHz})$  (mW)  
SAR evaluation is typically not required for FCC or TCB approval  
(BT power= 4.22 dBm)
12. The highest 1-g SAR for WLAN is 0.019W/kg and the highest 1-g SAR for WWAN is 1.05W/kg. The sum of 1-g for simultaneous transmitting WLAN and WWAN antenna pair is  $0.019+1.05 = 1.069$  W/kg  $< 1.6$  W/kg. According to KDB648474/ KDB447498 /KDB248227 Simultaneous SAR evaluation is not required.

## 1.6 Positioning Procedure



Phone position 1, "cheek" or "touch" position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning



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Phone position 2, "tilted position." The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning

Cheek/Touch Position:

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the handset was brought toward the mouth of the head phantom by pivoting against the ear reference point until any point of the mouthpiece or keypad touched the phantom.

Ear/Tilt Position:

With the phone aligned in the Cheek/Touch position, the handset was tilted away from the mouth with respect to the test device reference point by 15 degrees.

## 1.7 Evaluation Procedures

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

1. The extraction of the measured data (grid and values) from the Zoom Scan.
2. The calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
3. The generation of a high-resolution mesh within the measured volume
4. The interpolation of all measured values from the measurement grid to the high-resolution grid
5. The extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
6. The calculation of the averaged SAR within masses of 1g and 10g. The probe is calibrated at the center of the dipole sensors that is located 1 to 2.7mm away from the probe tip. During measurements, the probe stops shortly above the phantom surface, depending on the probe and the surface detecting system. Both distances are included as parameters in the probe configuration file. The software always knows exactly how far away the measured point is from the surface. As the probe cannot directly measure at the surface, the values between the deepest measured point and the surface must be extrapolated. The angle between the probe axis and the surface normal line is less than 30 degree.

In the Area Scan, the gradient of the interpolation function is evaluated to find all the extreme of the SAR distribution. The uncertainty on the locations of the extreme is less than 1/20 of the grid size. Only local maximum within -2 dB of the global maximum are searched and passed for the Cube Scan measurement. In the Cube Scan, the

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interpolation function is used to extrapolate the Peak SAR from the lowest measurement points to the inner phantom surface (the extrapolation distance). The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5mm.

The maximum search is automatically performed after each area scan measurement. It is based on splines in two or three dimensions. The procedure can find the maximum for most SAR distributions even with relatively large grid spacing. After the area scanning measurement, the probe is automatically moved to a position at the interpolated maximum. The following scan can directly use this position for reference, e.g., for a finer resolution grid or the cube evaluations. The 1g and 10g peak evaluations are only available for the predefined cube 7x7x7 scans.

The routines are verified and optimized for the grid dimensions used in these cube measurements. The measured volume of 30x30x30mm contains about 30g of tissue. The first procedure is an extrapolation (incl. Boundary correction) to get the points between the lowest measured plane and the surface. The next step uses 3D interpolation to get all points within the measured volume. In the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is the moved around until the highest averaged SAR is found.

If the highest SAR is found at the edge of the measured volume, the system will issue a warning: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

## 1.8 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 5 professional system). A Model EX3DV4 field probe is used to determine the internal electric fields. The SAR can be obtained from the equation  $SAR = \sigma (|E_i|^2) / \rho$  where  $\sigma$  and  $\rho$  are the conductivity and mass density of the tissue-simulant.

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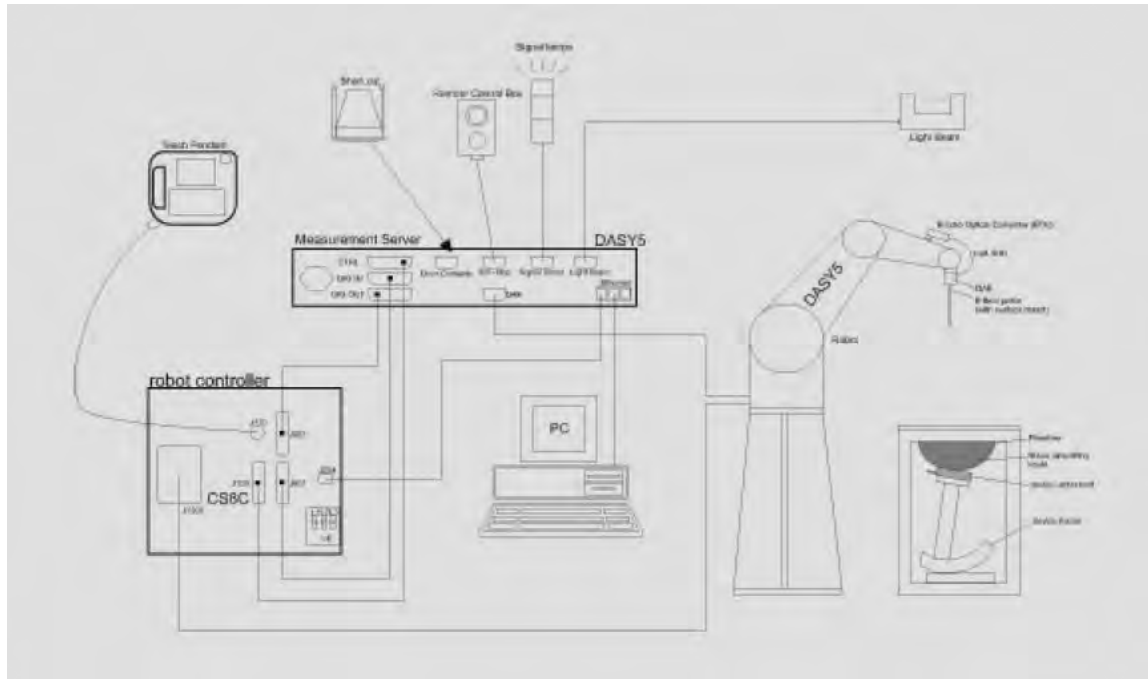


Fig.a The block diagram of SAR system

The DASY5 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 is for accommodating the data acquisition electronics (DAE).
- A dosimetric 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.
- 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.

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- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
  - A computer operating Windows 2000 or Windows XP.
  - DASY5 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
  - The SAM twin phantom enabling testing left-hand and right-hand usage.
  - The device holder for handheld mobile phones.
  - Tissue simulating liquid mixed according to the given recipes.
  - Validation dipole kits allowing to validate the proper functioning of the system.


## 1.9 System Components

### EX3DV4 E-Field Probe


Construction:	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Calibration:	Basic Broad Band Calibration in air Conversion Factors (CF) for MSL835/1900/2450MHz Additional CF for other liquids and frequencies upon request	
Frequency:	10 MHz to > 4 GHz; Linearity: $\pm 0.6$ dB (30 MHz to 6 GHz)	
Directivity:	$\pm 0.3$ dB in HSL (rotation around probe axis) $\pm 0.5$ dB in tissue material (rotation normal to probe axis)	
Dynamic Range:	10 $\mu$ W/g to > 100 mW/g; Linearity: $\pm 0.6$ dB (noise: typically < 1 $\mu$ W/g)	
Dimensions:	Overall length: 337 mm (Tip: 9 mm) Tip diameter: 2.5 mm (Body: 10 mm) Typical 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%.	

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### SAM PHANTOM V4.0C

Construction:	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X, CENELEC 50361 and IEC 62209. 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 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 with the robot.	
Shell Thickness:	2 ± 0.2 mm	
Filling Volume:	Approx. 25 liters	
Dimensions:	Height: 850 mm; Length: 1000 mm; Width: 500 mm	

### DEVICE HOLDER

Construction	In combination with the Twin SAM Phantom V4.0/V4.0C or Twin SAM, the Mounting Device (made from POM) enables the rotation of the mounted transmitter in spherical coordinates, whereby the rotation point is the ear opening. The devices can be easily and accurately positioned according to IEC, IEEE, CENELEC, FCC or other specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).	 <p style="text-align: center;">Device Holder</p>
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## 1.10 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 +/-5% from the target SAR values. These tests were done at 835/1900/2450 MHz. The tests were conducted on the same days as the measurement of the DUT. 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 22.1°C, the relative humidity was in the range 62% 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.

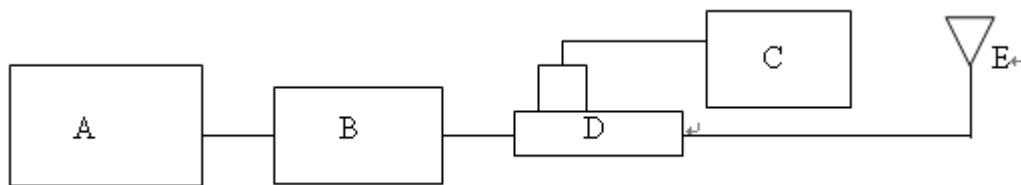
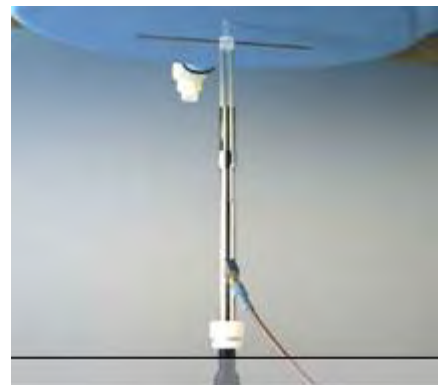


Fig.b The block diagram of system verification

- A. Agilent Model N5181A Signal Generator
- B. Mini circuits Model ZHL-42 Amplifier
- C. Agilent Model U2001B Power Sensor
- D. Agilent Model 772D/778D Dual directional coupling
- E. Reference dipole antenna



Photograph of the dipole Antenna

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Validation Kit	Frequency (MHz)	Target SAR (1g) (Pin=250mW)	Measured SAR (1g)	Measured Date
D835V2 S/N: 4d063	835 MHz (Head)	2.31 mW/g	2.38 mW/g	2011-09-24
D835V2 S/N: 4d063	835 MHz (Body)	2.43 mW/g	2.41 mW/g	2011-09-24
D1900V2 S/N: 5d027	1900 MHz (Head)	10.1 mW/g	9.91 mW/g	2011-09-26
D1900V2 S/N: 5d018	1900MHz (Body)	9.93 mW/g	9.62 mW/g	2011-09-26
D2450V2 S/N: 727	2450 MHz (Body)	12.7 mW/g	13.6 mW/g	2011-09-26

Table 1. System validation (follow manufacture target value)

### 1.11 Tissue Simulant Fluid for the Frequency Band

The dielectric properties for this Head-simulant fluid were measured by using the HP Model 85070E Dielectric Probe (rates frequency band 200 MHz to 20 GHz) in conjunction with HP E5071C Network Analyzer (9 kHz-6.5GHz) by using a procedure detailed in Section V.

All dielectric parameters of tissue simulates were measured within 24 hours of SAR measurements. The depth of the tissue simulant in the flat section of the phantom was 15cm±5mm during all tests. (Appendix Fig .2)

Frequency (MHz)	Tissue type	Measurement date/ Limits	Dielectric Parameters		
			$\rho$	$\sigma$ (S/m)	Simulated Tissue Temperature(° C)
835	Head	Measured, 2011-09-24	41.927	0.9	21.7
		Test CH 128	42.08	0.889	21.7
		Test CH 190	41.899	0.902	21.7
		Test CH 251	41.744	0.914	21.7
		Recommended Limits	38.38-42.42	0.84-0.92	20-24
835	Body	Measured, 2011-09-24	53.198	1.008	21.7
		Test CH 190	53.175	1.01	21.7
		Recommended Limits	51.21-56.60	0.95-1.05	20-24
1900	Head	Measured, 2011-09-26	38.308	1.415	21.7
		Test CH 521	38.946	1.395	21.7
		Test CH 661	38.67	1.403	21.7
		Test CH 810	38.177	1.427	21.7
		Recommended Limits	37.05-40.95	1.34-1.47	20-24
1900	Body	Measured, 2011-09-26	51.721	1.523	21.7
		Test CH 521	51.851	1.469	21.7
		Test CH 661	51.788	1.501	21.7
		Test CH 810	51.685	1.534	21.7
		Recommended Limits	48.55-53.66	1.44-1.60	20-24
2450	Body	Measured, 2011-09-26	51.592	1.964	21.7
		Test CH 6	51.645	1.945	21.7
		Recommended Limits	48.07-53.13	1.82-2.01	20-24

Table 2. Dielectric Parameters of Tissue Simulant Fluid

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## The composition of the brain tissue simulating liquid:

Ingredient	835MHz (Head)	835MHz (Body)	1900MHz (Head)	1900MHz (Body)	2450MHz (Body)
DGMBE	X	X	444.52 g	300.67 g	301.7ml
Water	532.98 g	631.68 g	552.42 g	716.56 g	698.3ml
Salt	18.3 g	11.72 g	3.06 g	4.0 g	X
Preventol D-7	2.4 g	1.2 g	X	X	X
Cellulose	3.2 g	X	X	X	X
Sugar	766.0 g	600 g	X	X	X
Total amount	1 L (1.0kg)	1 L (1.0kg)	1 L (1.0kg)	1 L (1.0kg)	1 L (1.0kg)

Table 3. Recipes for tissue simulating liquid

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## 1.12 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 C95.1-1992, Copyright 1992 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.

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(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 .6)

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

Table 4. RF exposure limits

Notes:

1. Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.
2. Controlled environments are defined as locations where there is potential exposure of individuals who have knowledge of their potential exposure and can exercise control over their exposure.

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## 2. Summary of Results

### GSM 850

<b>Right Head (Cheek Position)</b>						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
850 MHz	128	824.2	32.50 dBm	0.059	22.1	21.7
	190	836.6	32.40 dBm	0.080	22.1	21.7
	251	848.8	32.30 dBm	0.093	22.1	21.7
<b>Left Head (Cheek Position)</b>						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
850 MHz	190	836.6	32.40 dBm	0.069	22.1	21.7
<b>Right Head (15° Tilt Position)</b>						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
850 MHz	190	836.6	32.40 dBm	0.057	22.1	21.7
<b>Left Head (15° Tilt Position)</b>						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
850 MHz	190	836.6	32.40 dBm	0.048	22.1	21.7
<b>Right Head (Cheek Position)_repeated with Memory Card</b>						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
850 MHz	251	848.8	32.30 dBm	0.097	22.1	21.7
<b>Body_Back Side (2 multi-slot_1 down 2 up)</b>						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
850MHz	190	836.6	32.40dBm	0.284	22.1	21.7
<b>Body_Back Side (1 multi-slot_1 down 1 up)</b>						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
835MHz	190	836.6	32.40dBm	0.137	22.1	21.7

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## GSM 1900

<b>Right Head (Cheek Position)</b>						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ °C]	Liquid Temp[ °C]
1900MHz	512	1850.2	28.30 dBm	0.018	22.1	21.7
	661	1880.0	28.20 dBm	0.029	22.1	21.7
	810	1909.8	28.30 dBm	0.034	22.1	21.7
<b>Left Head (Cheek Position)</b>						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ °C]	Liquid Temp[ °C]
1900MHz	661	1880.0	28.20 dBm	0.029	22.1	21.7
<b>Right Head (15° Tilt Position)</b>						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ °C]	Liquid Temp[ °C]
1900MHz	661	1880.0	28.20 dBm	0.020	22.1	21.7
<b>Left Head (15° Tilt Position)</b>						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ °C]	Liquid Temp[ °C]
1900MHz	661	1880.0	28.20 dBm	0.029	22.1	21.7
<b>Body_Back Side (2 multi-slot_1 down 2 up)</b>						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ °C]	Liquid Temp[ °C]
1900MHz	512	1850.2	24.40 dBm	0.822	22.1	21.7
	661	1880.0	24.50 dBm	0.970	22.1	21.7
	810	1909.8	24.30 dBm	<b>1.05</b>	22.1	21.7
<b>Body_Back Side (1 multi-slot_1 down 1 up)</b>						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ °C]	Liquid Temp[ °C]
1900MHz	810	1909.8	28.30 dBm	0.513	22.1	21.7

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<b>Body_Front Side (2 multi-slot_1 down 2 up)</b>						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
1900MHz	810	1909.8	24.30 dBm	0.050	22.1	21.7
<b>Body_Back Side (2 multi-slot_1 down 2 up)_repeated with Memory Card</b>						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g /10g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
1900MHz	810	1909.8	24.30 dBm	0.894	22.1	21.7

## WLAN802.11 b

<b>Body_Front Side_</b>						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
2450 MHz	6	2437	11.92 dBm	0.013	22.1	21.7
<b>Body_ Back Side</b>						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
2450 MHz	6	2437	11.92 dBm	0.00203	22.1	21.7
<b>Body_ Front Side_repeated with Memory Card</b>						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
2450 MHz	6	2437	11.92 dBm	0.019	22.1	21.7

## WLAN802.11 g

<b>Body_Front Side_</b>						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
2450 MHz	6	2437	13.04 dBm	0.011	22.1	21.7

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### 3. Instruments List

Manufacturer	Device	Type	Serial number	Date of last calibration
Schmid & Partner Engineering AG	Dosimetric E-Field Probe	EX3DV4	3770	Apr.19.2011
Schmid & Partner Engineering AG	835/1900/2450 MHz System Validation Dipole	D835V2	4d063	May.25.2011
		D1900V2	5d027	Apr.19.2011
		D2450V2	727	Apr.19.2011
Schmid & Partner Engineering AG	Data acquisition Electronics	DAE4	856	May.18.2011
Schmid & Partner Engineering AG	Software	DASY 5 V52.6.2 Build482	N/A	Calibration not required
Schmid & Partner Engineering AG	Phantom	SAM	N/A	Calibration not required
HP	Network Analyzer	E5071C	MY46107530	Jan.12.2011
HP	Dielectric Probe Kit	85070E	MY44300554	Calibration not required
Agilent	Dual-directional coupler	772D	MY46151242	Jul.07.2011
		778D	MY48220468	Mar.29.2011
Agilent	RF Signal Generator	3847M00432	Jun.01.2011	Jun.01.2011
Agilent	USB Power Sensor (Meter)	U2001B	MY48100169	Apr.28.2011
Agilent	Radio Communication Test	E5515c	GB44051912	JUL.27 .2010

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## 4. Measurements

Date: 9/24/2011

### RE Cheek\_CH128

Communication System: Generic GSM; Frequency: 824.2 MHz

Medium parameters used:  $f = 824.2$  MHz;  $\sigma = 0.889$  mho/m;  $\epsilon_r = 42.08$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(9.25, 9.25, 9.25); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

### Configuration/RE Cheek/Area Scan (81x161x1): Measurement grid:

$dx=15$ mm,  $dy=15$ mm

Maximum value of SAR (interpolated) = 0.062 mW/g

### Configuration/RE Cheek/Zoom Scan (7x7x7) (7x7x7)/Cube 0:

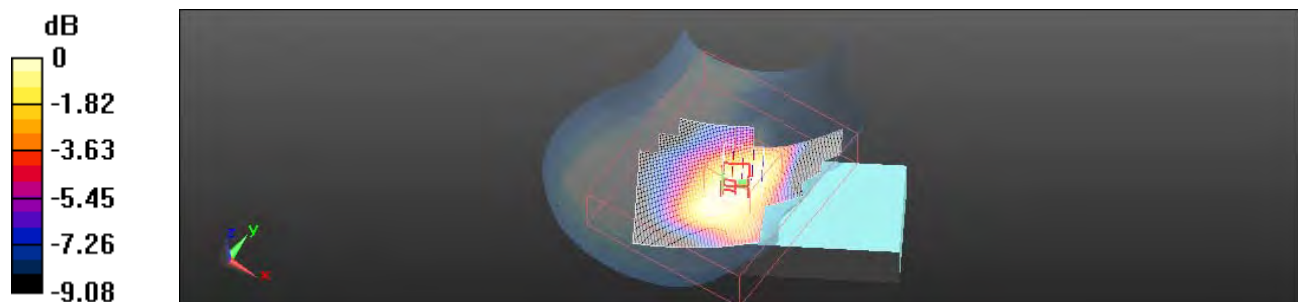
Measurement grid:  $dx=8$ mm,  $dy=8$ mm,  $dz=5$ mm

Reference Value = 4.440 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 0.070 W/kg

**SAR(1 g) = 0.059 mW/g; SAR(10 g) = 0.047 mW/g**

Maximum value of SAR (measured) = 0.062 mW/g



0 dB = 0.060mW/g

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Date: 9/24/2011

## RE Cheek\_CH190

Communication System: Generic GSM; Frequency: 836.6 MHz

Medium parameters used:  $f = 837$  MHz;  $\sigma = 0.902$  mho/m;  $\epsilon_r = 41.899$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(9.25, 9.25, 9.25); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/RE Cheek/Area Scan (81x161x1):** Measurement grid:

$dx=15$ mm,  $dy=15$ mm

Maximum value of SAR (interpolated) = 0.086 mW/g

**Configuration/RE Cheek/Zoom Scan (7x7x7) (7x7x7)/Cube 0:**

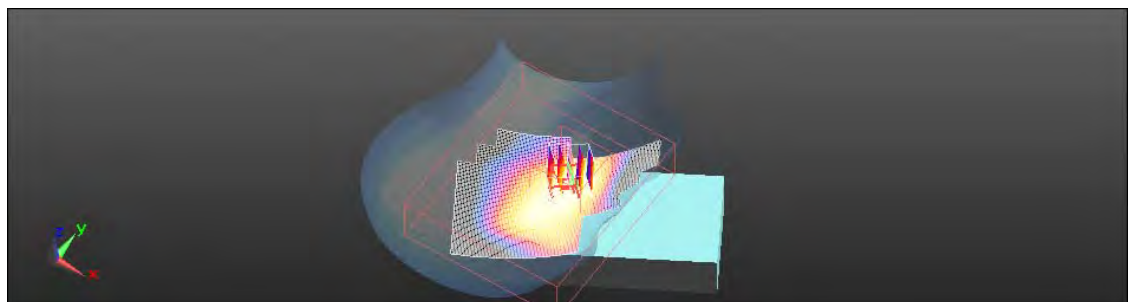
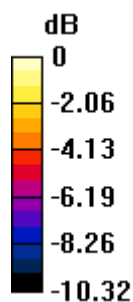
Measurement grid:  $dx=8$ mm,  $dy=8$ mm,  $dz=5$ mm

Reference Value = 4.686 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.104 W/kg

**SAR(1 g) = 0.080 mW/g; SAR(10 g) = 0.060 mW/g**

Maximum value of SAR (measured) = 0.084 mW/g



0 dB = 0.080mW/g

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Date: 9/24/2011

## RE Cheek\_CH251

Communication System: Generic GSM; Frequency: 848.6 MHz

Medium parameters used:  $f = 849$  MHz;  $\sigma = 0.914$  mho/m;  $\epsilon_r = 41.744$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(9.25, 9.25, 9.25); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

### Configuration/RE Cheek/Area Scan (81x161x1): Measurement grid:

$dx=15$ mm,  $dy=15$ mm

Maximum value of SAR (interpolated) = 0.101 mW/g

### Configuration/RE Cheek/Zoom Scan (7x7x7) (7x7x7)/Cube 0:

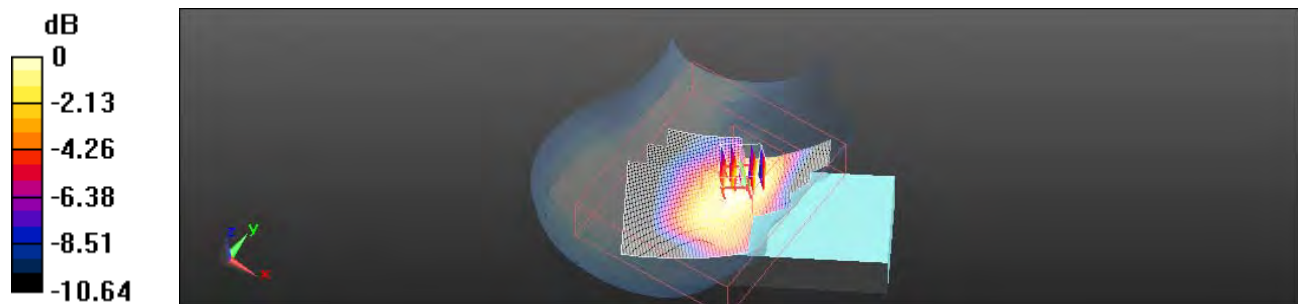
Measurement grid:  $dx=8$ mm,  $dy=8$ mm,  $dz=5$ mm

Reference Value = 4.409 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.124 W/kg

**SAR(1 g) = 0.093 mW/g; SAR(10 g) = 0.070 mW/g**

Maximum value of SAR (measured) = 0.098 mW/g



0 dB = 0.100mW/g

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Date: 9/24/2011

## LE Cheek\_CH190

Communication System: Generic GSM; Frequency: 836.6 MHz

Medium parameters used:  $f = 837$  MHz;  $\sigma = 0.902$  mho/m;  $\epsilon_r = 41.899$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(9.25, 9.25, 9.25); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/LE Cheek/Area Scan (81x161x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.076 mW/g

**Configuration/LE Cheek/Zoom Scan (7x7x7) (7x7x7)/Cube 0:**

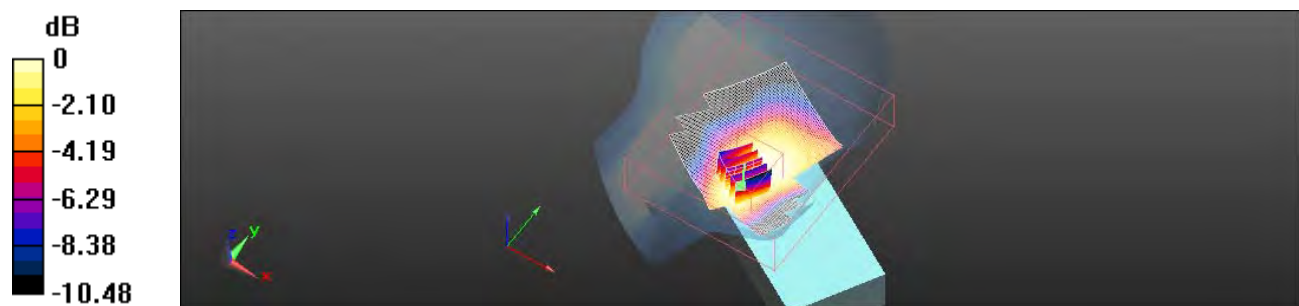
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.530 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 0.092 W/kg

**SAR(1 g) = 0.069 mW/g; SAR(10 g) = 0.053 mW/g**

Maximum value of SAR (measured) = 0.073 mW/g



0 dB = 0.070mW/g

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Date: 9/24/2011

## RE Tilt\_CH190

Communication System: Generic GSM; Frequency: 836.6 MHz

Medium parameters used:  $f = 837$  MHz;  $\sigma = 0.902$  mho/m;  $\epsilon_r = 41.899$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(9.25, 9.25, 9.25); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/RE Tilt/Area Scan (81x161x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.060 mW/g

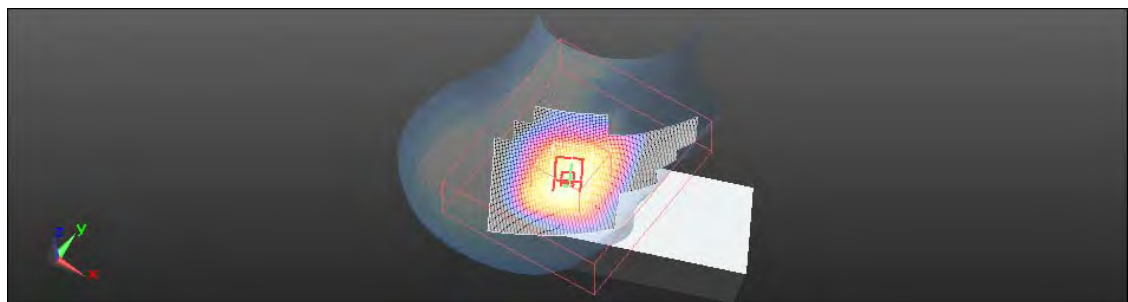
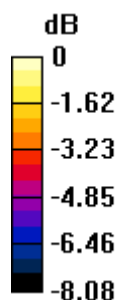
**Configuration/RE Tilt/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.024 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 0.069 W/kg

**SAR(1 g) = 0.057 mW/g; SAR(10 g) = 0.044 mW/g**

Maximum value of SAR (measured) = 0.060 mW/g



0 dB = 0.060mW/g

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Date: 9/24/2011

## LE Tilt\_CH190

Communication System: Generic GSM; Frequency: 836.6 MHz

Medium parameters used:  $f = 837$  MHz;  $\sigma = 0.902$  mho/m;  $\epsilon_r = 41.899$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(9.25, 9.25, 9.25); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/LE Tilt/Area Scan (81x161x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.050 mW/g

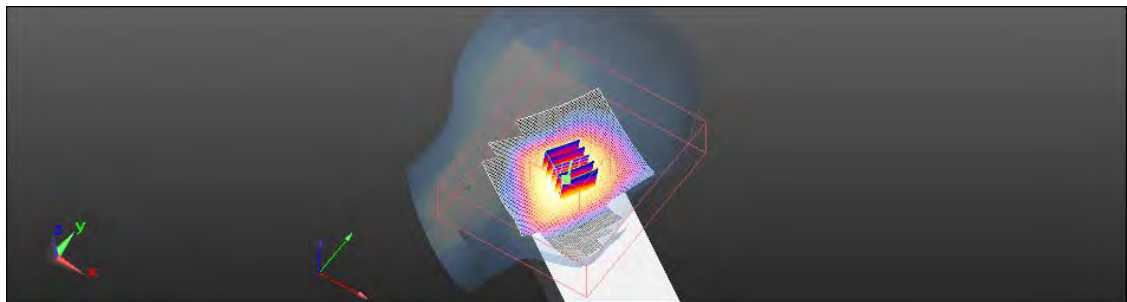
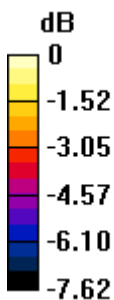
**Configuration/LE Tilt/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.352 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.058 W/kg

**SAR(1 g) = 0.048 mW/g; SAR(10 g) = 0.037 mW/g**

Maximum value of SAR (measured) = 0.050 mW/g



0 dB = 0.050mW/g

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Date: 9/24/2011

## RE Cheek\_CH251\_repeated with Memory card

Communication System: Generic GSM; Frequency: 848.6 MHz

 Medium parameters used:  $f = 849$  MHz;  $\sigma = 0.914$  mho/m;  $\epsilon_r = 41.744$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(9.25, 9.25, 9.25); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

### Configuration/RE Cheek/Area Scan (81x161x1): Measurement grid:

dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.105 mW/g

### Configuration/RE Cheek/Zoom Scan (7x7x7) (7x7x7)/Cube 0:

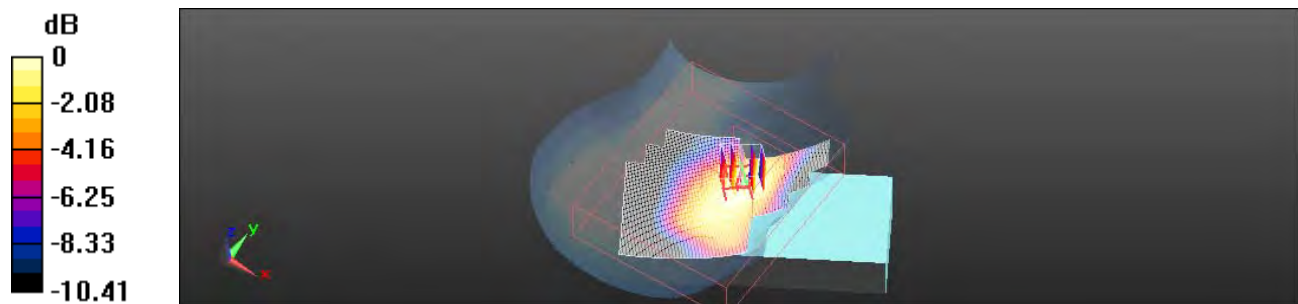
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.878 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 0.127 W/kg

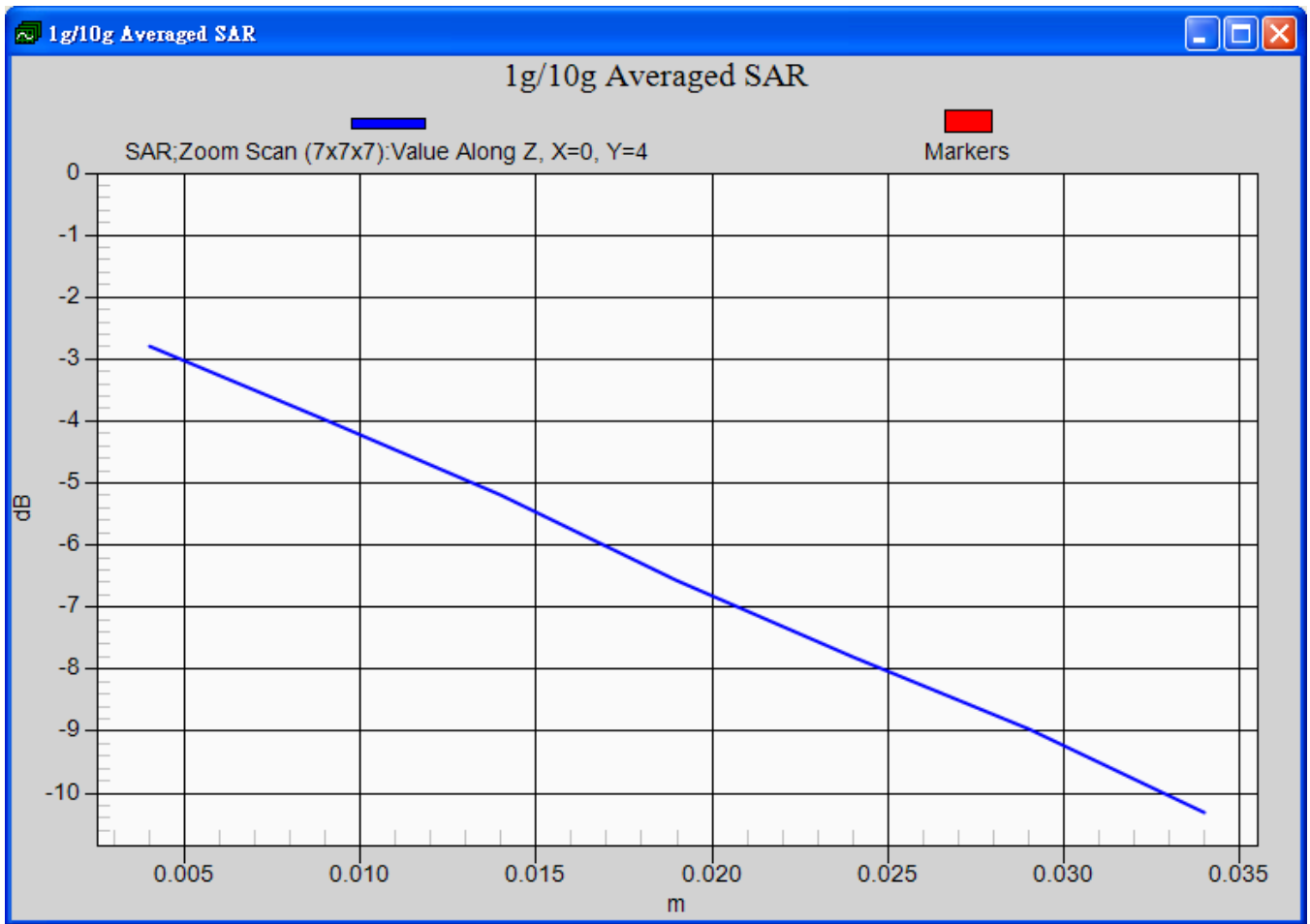
**SAR(1 g) = 0.097 mW/g; SAR(10 g) = 0.072 mW/g**

Maximum value of SAR (measured) = 0.102 mW/g



0 dB = 0.100mW/g

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Date: 9/24/2011

## Body\_CH190

Communication System: GPRS(Class 10); Frequency: 836.6 MHz

Medium parameters used:  $f = 837$  MHz;  $\sigma = 1.01$  mho/m;  $\epsilon_r = 53.175$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(9.3, 9.3, 9.3); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASYS2, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/Body/Area Scan (81x161x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.284 mW/g

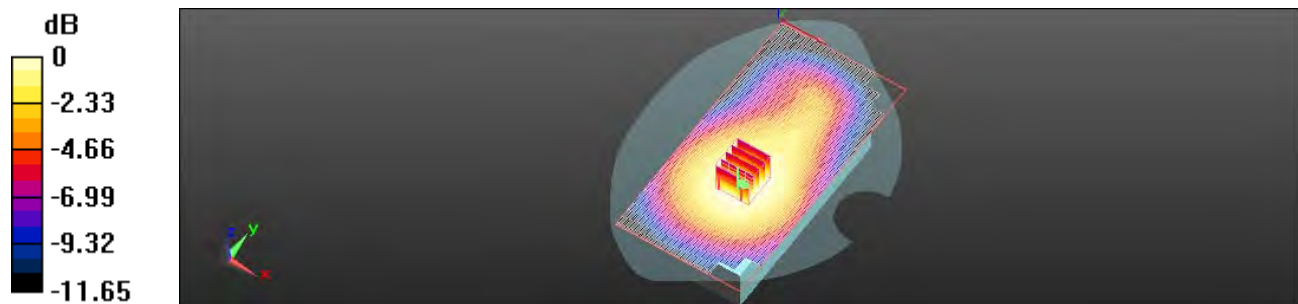
**Configuration/Body/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 15.024 V/m; Power Drift = 0.00013 dB

Peak SAR (extrapolated) = 0.369 W/kg

**SAR(1 g) = 0.284 mW/g; SAR(10 g) = 0.205 mW/g**

Maximum value of SAR (measured) = 0.291 mW/g



0 dB = 0.290mW/g

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Date: 9/24/2011

## Body\_CH190\_class 8

Communication System: GPRS(Class 8); Frequency: 836.6 MHz

Medium parameters used:  $f = 837$  MHz;  $\sigma = 1.01$  mho/m;  $\epsilon_r = 53.175$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(9.3, 9.3, 9.3); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/Body/Area Scan (81x161x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.143 mW/g

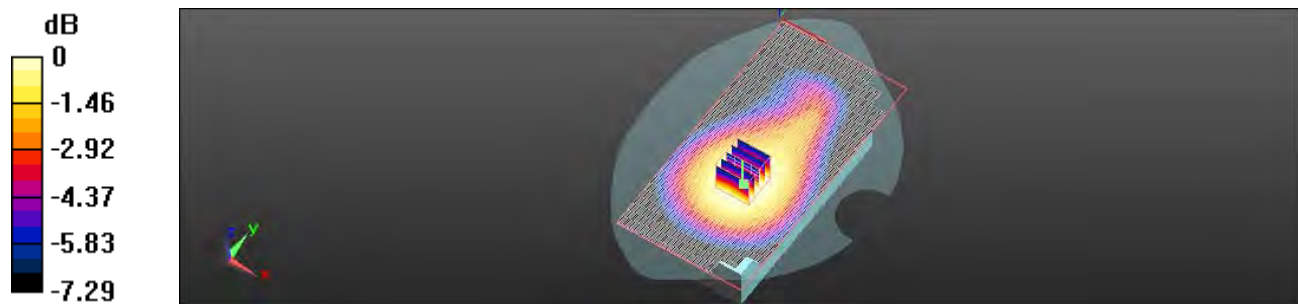
**Configuration/Body/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 10.610 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 0.169 W/kg

**SAR(1 g) = 0.137 mW/g; SAR(10 g) = 0.105 mW/g**

Maximum value of SAR (measured) = 0.142 mW/g



0 dB = 0.140mW/g

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Date: 9/26/2011

## RE Cheek\_CH512

Communication System: Generic GSM; Frequency: 1850.2 MHz

Medium parameters used:  $f = 1850.2$  MHz;  $\sigma = 1.395$  mho/m;  $\epsilon_r = 38.946$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.78, 7.78, 7.78); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

### Configuration/RE Cheek/Area Scan (81x161x1): Measurement grid:

$dx=15$ mm,  $dy=15$ mm

Maximum value of SAR (interpolated) = 0.022 mW/g

### Configuration/RE Cheek/Zoom Scan (7x7x7) (7x7x7)/Cube 0:

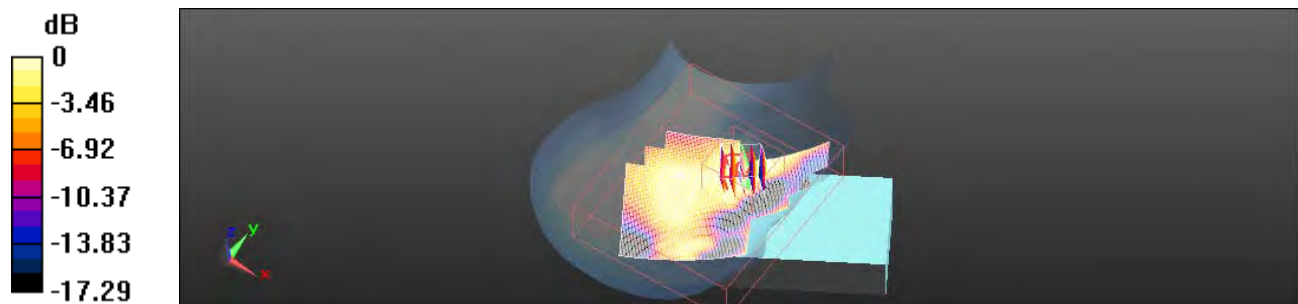
Measurement grid:  $dx=8$ mm,  $dy=8$ mm,  $dz=5$ mm

Reference Value = 2.831 V/m; Power Drift = 0.17 dB

Peak SAR (extrapolated) = 0.028 W/kg

**SAR(1 g) = 0.018 mW/g; SAR(10 g) = 0.011 mW/g**

Maximum value of SAR (measured) = 0.019 mW/g



0 dB = 0.020mW/g

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Date: 9/26/2011

## RE Cheek\_CH661

Communication System: Generic GSM; Frequency: 1880 MHz

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.403$  mho/m;  $\epsilon_r = 38.67$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.78, 7.78, 7.78); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/RE Cheek/Area Scan (81x161x1):** Measurement grid:

$dx=15$ mm,  $dy=15$ mm

Maximum value of SAR (interpolated) = 0.032 mW/g

**Configuration/RE Cheek/Zoom Scan (7x7x7) (7x7x7)/Cube 0:**

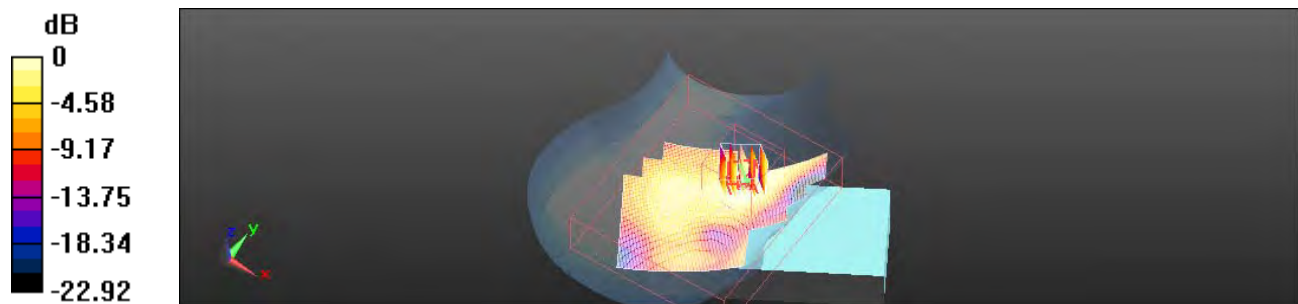
Measurement grid:  $dx=8$ mm,  $dy=8$ mm,  $dz=5$ mm

Reference Value = 3.293 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 0.044 W/kg

**SAR(1 g) = 0.029 mW/g; SAR(10 g) = 0.018 mW/g**

Maximum value of SAR (measured) = 0.031 mW/g



0 dB = 0.030mW/g

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Date: 9/26/2011

## RE Cheek\_CH810

Communication System: Generic GSM; Frequency: 1909.8 MHz

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.427$  mho/m;  $\epsilon_r = 38.177$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.78, 7.78, 7.78); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/RE Cheek/Area Scan (81x161x1):** Measurement grid:

$dx=15$ mm,  $dy=15$ mm

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

**Configuration/RE Cheek/Zoom Scan (7x7x7) (7x7x7)/Cube 0:**

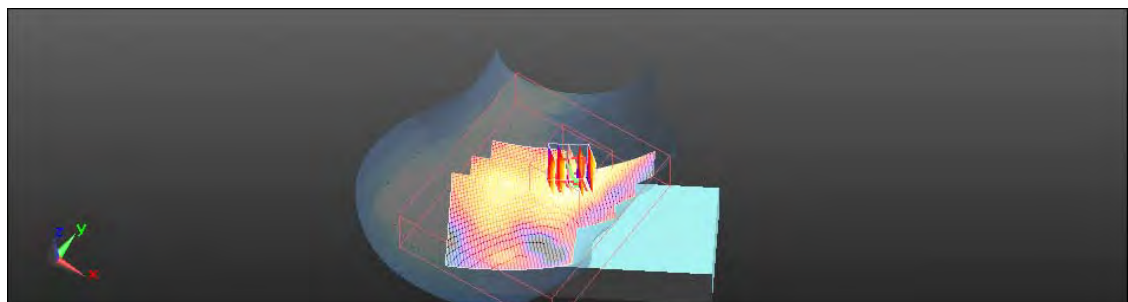
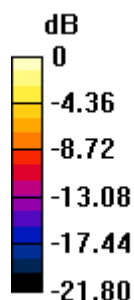
Measurement grid:  $dx=8$ mm,  $dy=8$ mm,  $dz=5$ mm

Reference Value = 3.122 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.052 W/kg

**SAR(1 g) = 0.034 mW/g; SAR(10 g) = 0.021 mW/g**

Maximum value of SAR (measured) = 0.036 mW/g



0 dB = 0.040mW/g

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Date: 9/26/2011

## LE Cheek\_CH661

Communication System: Generic GSM; Frequency: 1880 MHz

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.403$  mho/m;  $\epsilon_r = 38.67$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.78, 7.78, 7.78); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/LE Cheek/Area Scan (81x161x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.032 mW/g

**Configuration/LE Cheek/Zoom Scan (7x7x7) (7x7x7)/Cube 0:**

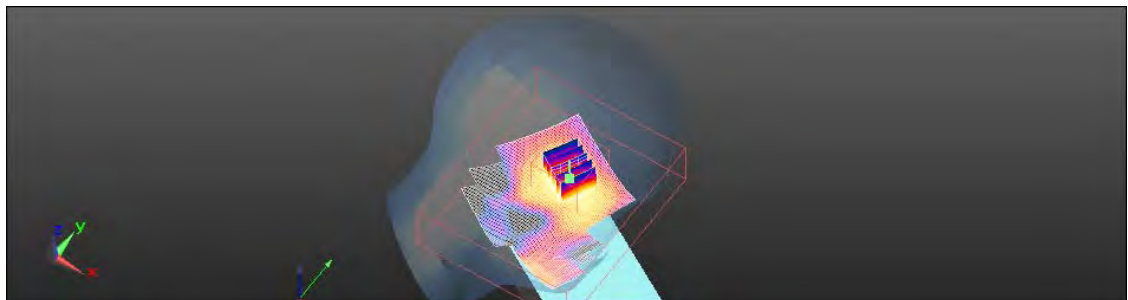
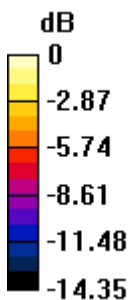
Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 2.831 V/m; Power Drift = -0.19 dB

Peak SAR (extrapolated) = 0.046 W/kg

**SAR(1 g) = 0.029 mW/g; SAR(10 g) = 0.018 mW/g**

Maximum value of SAR (measured) = 0.031 mW/g



0 dB = 0.030mW/g

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Date: 9/26/2011

## RE Tilt\_CH661

Communication System: Generic GSM; Frequency: 1880 MHz

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.403$  mho/m;  $\epsilon_r = 38.67$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Right Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.78, 7.78, 7.78); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/RE Tilt/Area Scan (81x161x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.023 mW/g

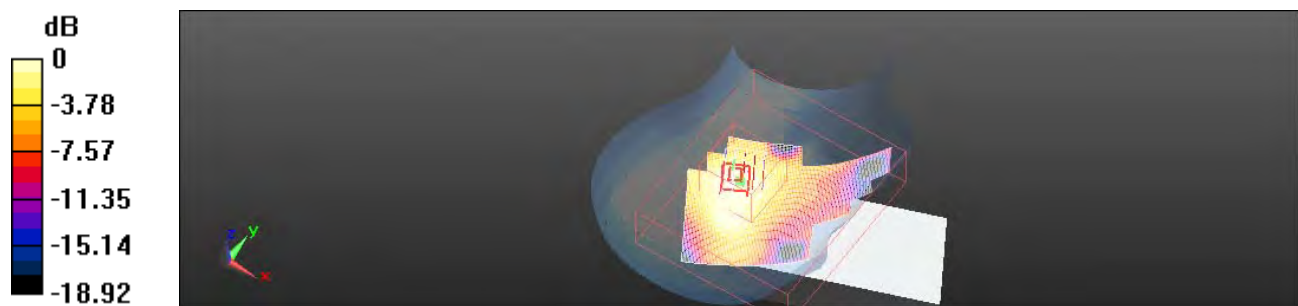
**Configuration/RE Tilt/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.731 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.030 W/kg

**SAR(1 g) = 0.020 mW/g; SAR(10 g) = 0.013 mW/g**

Maximum value of SAR (measured) = 0.022 mW/g



0 dB = 0.020mW/g

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Date: 9/26/2011

## LE Tilt\_CH661

Communication System: Generic GSM; Frequency: 1880 MHz

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.403$  mho/m;  $\epsilon_r = 38.67$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.78, 7.78, 7.78); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/LE Tilt/Area Scan (81x161x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.031 mW/g

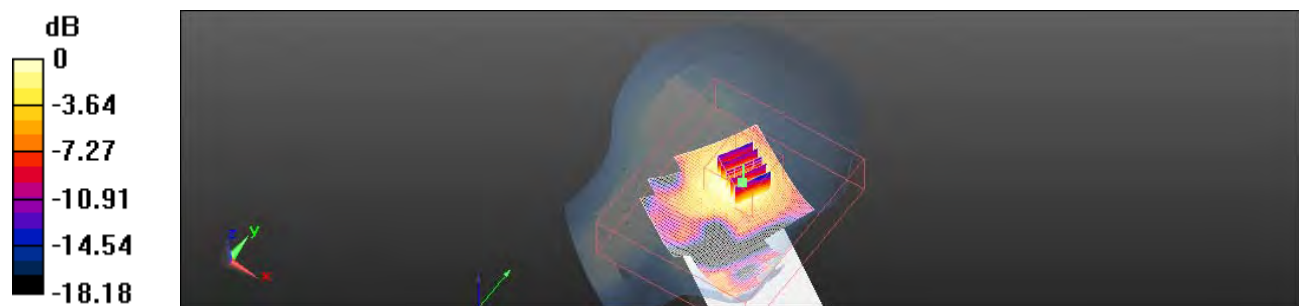
**Configuration/LE Tilt/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.445 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 0.045 W/kg

**SAR(1 g) = 0.029 mW/g; SAR(10 g) = 0.018 mW/g**

Maximum value of SAR (measured) = 0.032 mW/g



0 dB = 0.030mW/g

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Date: 9/26/2011

## Body\_CH512

Communication System: GPRS(Class 10); Frequency: 1850.2 MHz

Medium parameters used:  $f = 1850.2$  MHz;  $\sigma = 1.469$  mho/m;  $\epsilon_r = 51.851$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.51, 7.51, 7.51); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/Body/Area Scan (81x161x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.985 mW/g

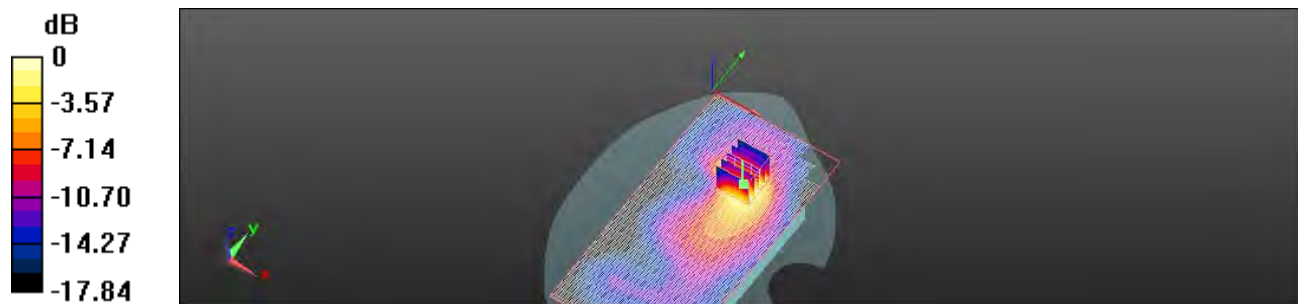
**Configuration/Body/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 10.255 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 1.323 W/kg

**SAR(1 g) = 0.822 mW/g; SAR(10 g) = 0.473 mW/g**

Maximum value of SAR (measured) = 0.911 mW/g



0 dB = 0.910mW/g

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Date: 9/26/2011

## Body\_CH661

Communication System: GPRS(Class 10); Frequency: 1880 MHz

Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.501$  mho/m;  $\epsilon_r = 51.788$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.51, 7.51, 7.51); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/Body/Area Scan (81x161x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.161 mW/g

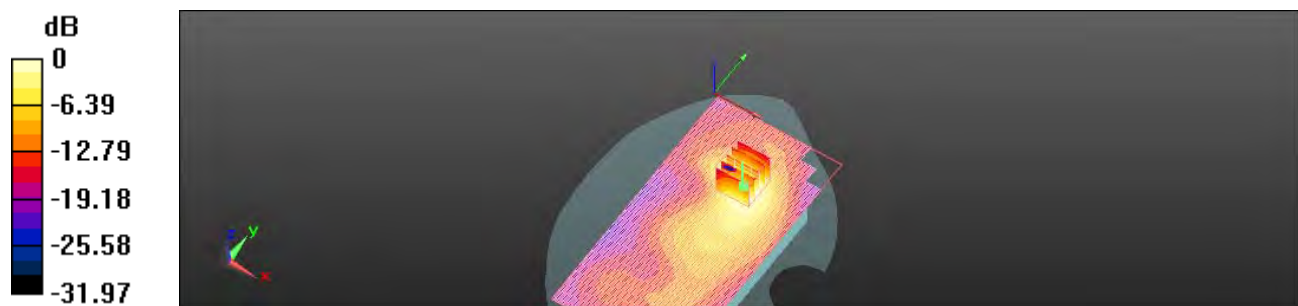
**Configuration/Body/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 10.436 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 1.563 W/kg

**SAR(1 g) = 0.970 mW/g; SAR(10 g) = 0.556 mW/g**

Maximum value of SAR (measured) = 1.064 mW/g



0 dB = 1.060mW/g

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Date: 9/26/2011

## Body\_CH810

Communication System: GPRS(Class 10); Frequency: 1909.8 MHz

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.534$  mho/m;  $\epsilon_r = 51.685$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.51, 7.51, 7.51); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/Body/Area Scan (81x161x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.232 mW/g

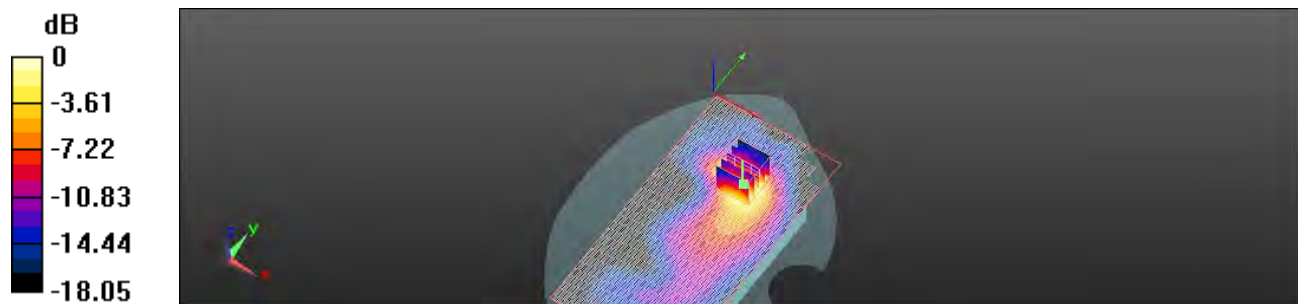
**Configuration/Body/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 9.738 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 1.696 W/kg

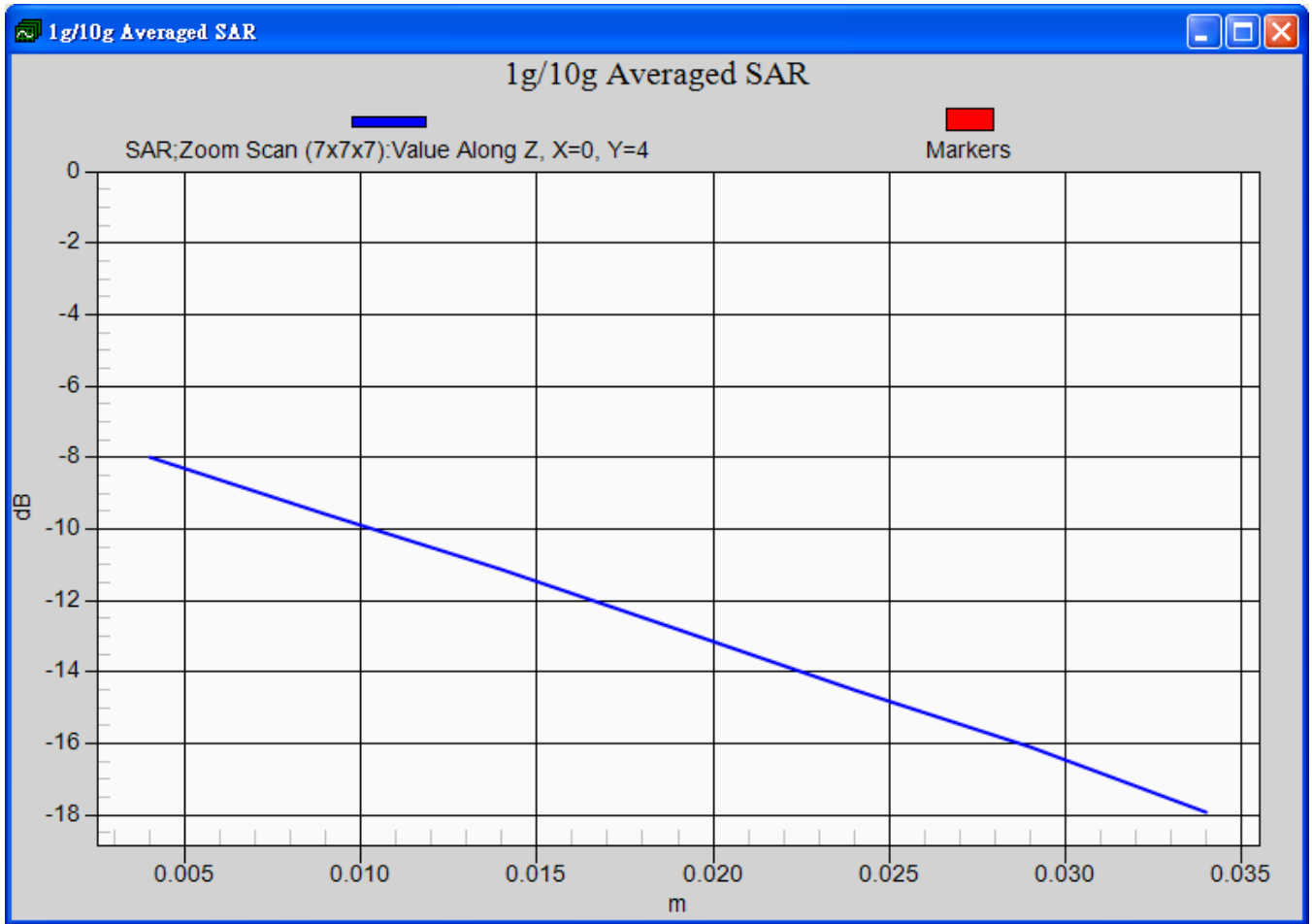
**SAR(1 g) = 1.05 mW/g; SAR(10 g) = 0.594 mW/g**

Maximum value of SAR (measured) = 1.157 mW/g



0 dB = 1.160mW/g

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Date: 9/26/2011

## Body\_CH810\_class 8

Communication System: GPRS(Class 8); Frequency: 1909.8 MHz

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.534$  mho/m;  $\epsilon_r = 51.685$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.51, 7.51, 7.51); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/Body/Area Scan (81x161x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.609 mW/g

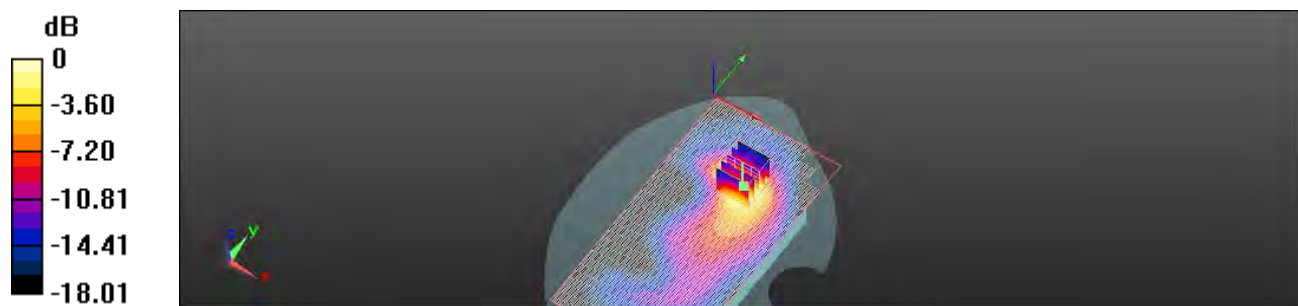
**Configuration/Body/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.847 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.827 W/kg

**SAR(1 g) = 0.513 mW/g; SAR(10 g) = 0.292 mW/g**

Maximum value of SAR (measured) = 0.562 mW/g



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Date: 9/26/2011

## Body\_CH810\_repeated for EUT front to phantom

Communication System: GPRS(Class 10); Frequency: 1909.8 MHz

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.534$  mho/m;  $\epsilon_r = 51.685$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.51, 7.51, 7.51); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/Body/Area Scan (81x161x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.054 mW/g

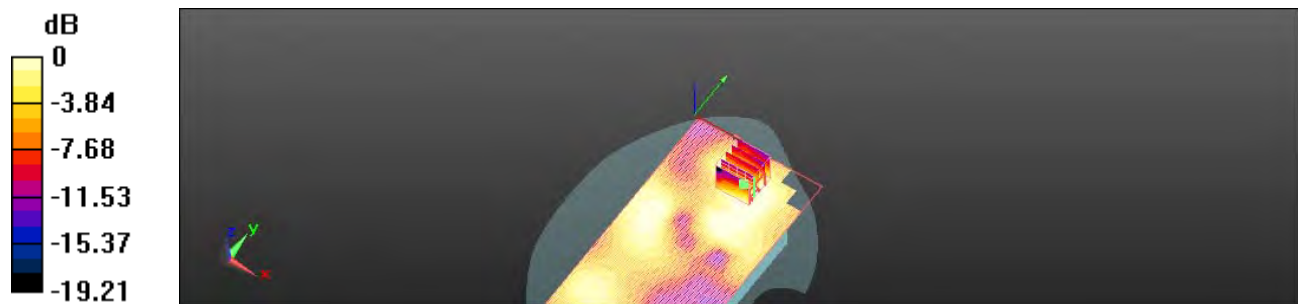
**Configuration/Body/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 2.579 V/m; Power Drift = 0.17 dB

Peak SAR (extrapolated) = 0.077 W/kg

**SAR(1 g) = 0.050 mW/g; SAR(10 g) = 0.032 mW/g**

Maximum value of SAR (measured) = 0.053 mW/g



0 dB = 0.050mW/g

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Date: 9/26/2011

## Body\_CH810\_repeated with Memory card

Communication System: GPRS(Class 10); Frequency: 1909.8 MHz

Medium parameters used:  $f = 1910$  MHz;  $\sigma = 1.534$  mho/m;  $\epsilon_r = 51.685$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.51, 7.51, 7.51); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/Body/Area Scan (81x161x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.064 mW/g

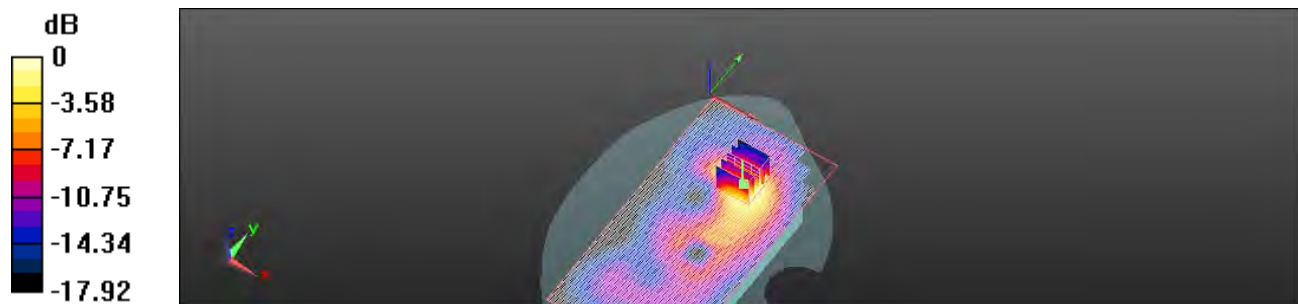
**Configuration/Body/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 9.677 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 1.400 W/kg

**SAR(1 g) = 0.894 mW/g; SAR(10 g) = 0.518 mW/g**

Maximum value of SAR (measured) = 0.969 mW/g



0 dB = 0.970mW/g

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Date: 9/26/2011

## Body\_WLAN802.11b\_CH6

Communication System: WLAN802.11 b & g & n(20M)(40M); Frequency: 2437 MHz  
Medium parameters used:  $f = 2437$  MHz;  $\sigma = 1.945$  mho/m;  $\epsilon_r = 51.645$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section  
Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)  
DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(6.96, 6.96, 6.96); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/Body/Area Scan (81x161x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.013 mW/g

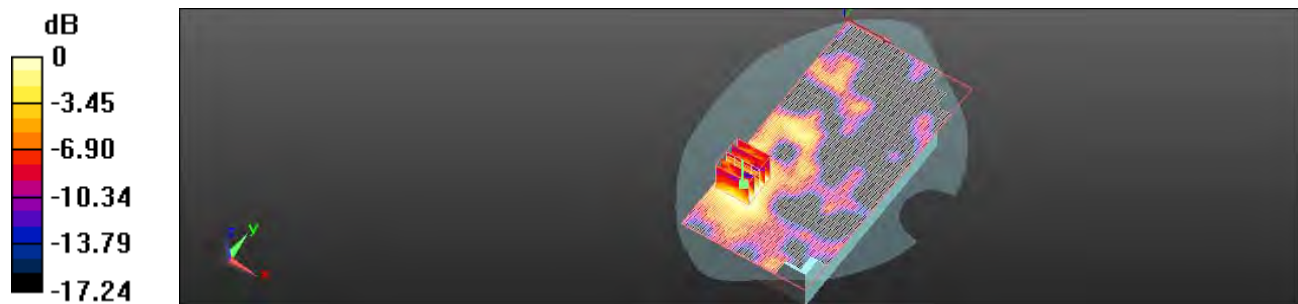
**Configuration/Body/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.770 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 0.022 W/kg

**SAR(1 g) = 0.013 mW/g; SAR(10 g) = 0.007 mW/g**

Maximum value of SAR (measured) = 0.014 mW/g



0 dB = 0.010mW/g

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Date: 9/26/2011

## Body\_WLAN802.11b\_CH6 \_repeated for EUT Back to phantom

Communication System: WLAN802.11 b & g & n(20M)(40M); Frequency: 2437 MHz  
Medium parameters used:  $f = 2437$  MHz;  $\sigma = 1.945$  mho/m;  $\epsilon_r = 51.645$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section  
Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)  
DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(6.96, 6.96, 6.96); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/Body/Area Scan (81x161x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.00532 mW/g

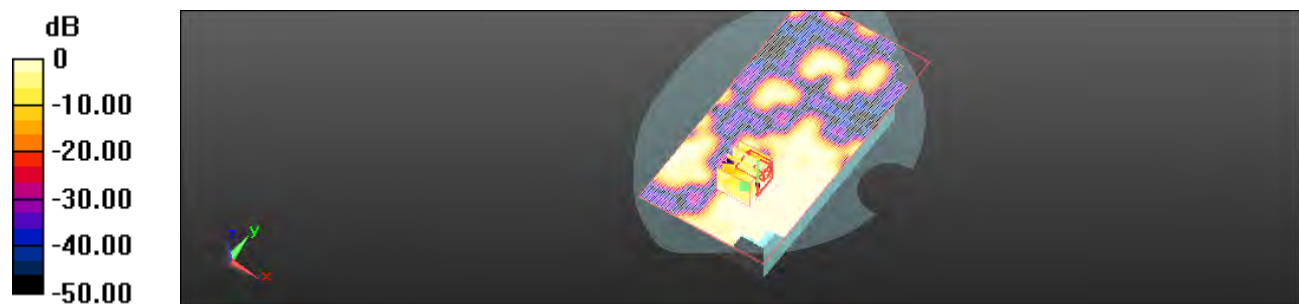
**Configuration/Body/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 1.126 V/m; Power Drift = -0.18 dB

Peak SAR (extrapolated) = 0.00502 W/kg

**SAR(1 g) = 0.00203 mW/g; SAR(10 g) = 0.000748 mW/g**

Maximum value of SAR (measured) = 0.00344 mW/g



0 dB = 0.0034mW/g

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Date: 9/26/2011

## Body\_WLAN802.11b\_CH6\_repeated with Memory card

Communication System: WLAN802.11 b & g & n(20M)(40M); Frequency: 2437 MHz  
Medium parameters used:  $f = 2437$  MHz;  $\sigma = 1.945$  mho/m;  $\epsilon_r = 51.645$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section  
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)  
DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(6.96, 6.96, 6.96); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/Body/Area Scan (81x161x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.019 mW/g

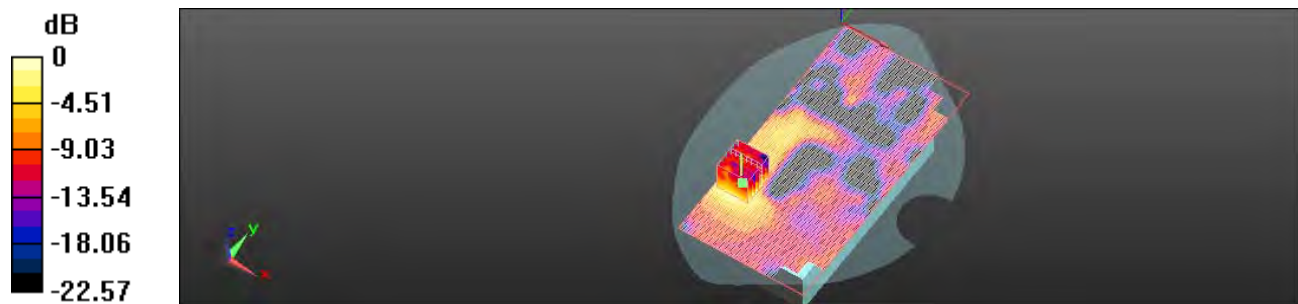
**Configuration/Body/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.977 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 0.035 W/kg

**SAR(1 g) = 0.019 mW/g; SAR(10 g) = 0.00997 mW/g**

Maximum value of SAR (measured) = 0.020 mW/g



0 dB = 0.020mW/g

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Date: 9/26/2011

## Body\_WLAN802.11g\_CH6

Communication System: WLAN802.11 b & g & n(20M)(40M); Frequency: 2437 MHz  
Medium parameters used:  $f = 2437$  MHz;  $\sigma = 1.945$  mho/m;  $\epsilon_r = 51.645$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section  
Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2007)  
DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(6.96, 6.96, 6.96); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/Body/Area Scan (81x161x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.012 mW/g

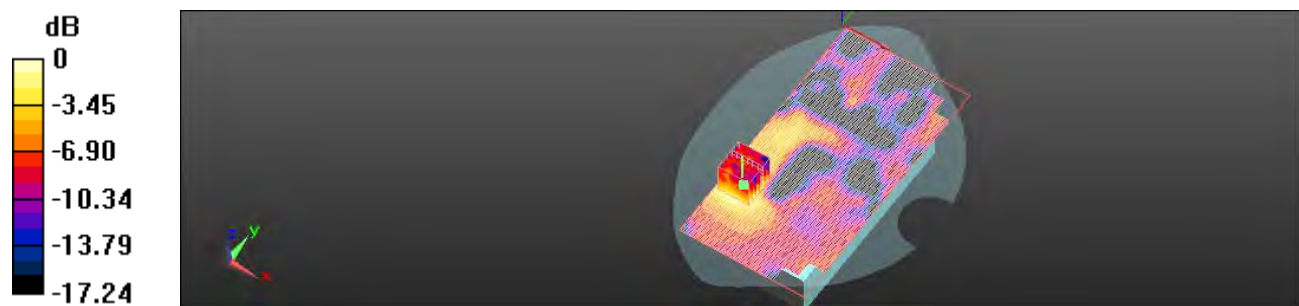
**Configuration/Body/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.710 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 0.026 W/kg

**SAR(1 g) = 0.011 mW/g; SAR(10 g) = 0.00618 mW/g**

Maximum value of SAR (measured) = 0.012 mW/g



0 dB = 0.010mW/g

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## 5. System Verification

Date: 9/24/2011

Communication System: CW; Frequency: 835 MHz

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.9$  mho/m;  $\epsilon_r = 41.927$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(9.25, 9.25, 9.25); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASYS52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/d=15mm, Pin=250mW, dist=2mm:** Measurement grid:

$dx=15$ mm,  $dy=15$ mm

Maximum value of SAR (interpolated) = 2.569 mW/g

**Configuration/d=15mm, Pin=250mW, dist=2mm:** Measurement grid:

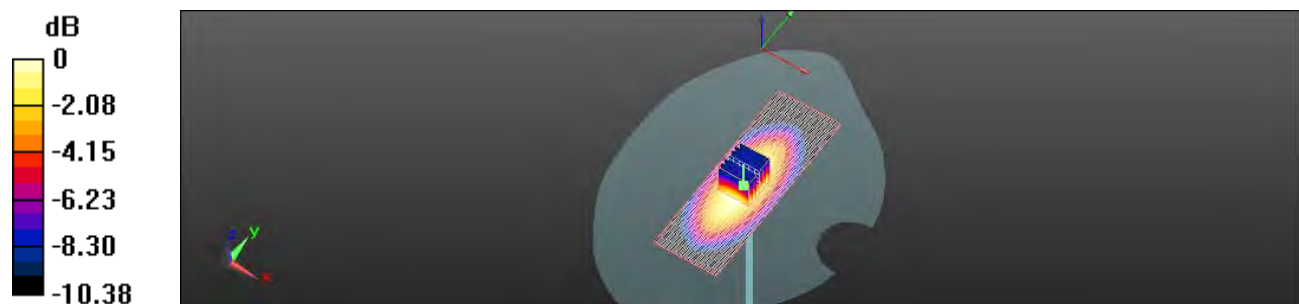
$dx=5$ mm,  $dy=5$ mm,  $dz=5$ mm

Reference Value = 54.171 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 3.580 W/kg

**SAR(1 g) = 2.38 mW/g; SAR(10 g) = 1.56 mW/g**

Maximum value of SAR (measured) = 2.572 mW/g



0 dB = 2.570mW/g

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Date: 9/24/2011

Communication System: CW; Frequency: 835 MHz

 Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 1.008 \text{ mho/m}$ ;  $\epsilon_r = 53.198$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(9.3, 9.3, 9.3); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/d=15mm, Pin=250mW, dist=2mm:** Measurement grid:

 $dx=15\text{mm}$ ,  $dy=15\text{mm}$ 

Maximum value of SAR (interpolated) = 2.604 mW/g

**Configuration/d=15mm, Pin=250mW, dist=2mm:** Measurement grid:

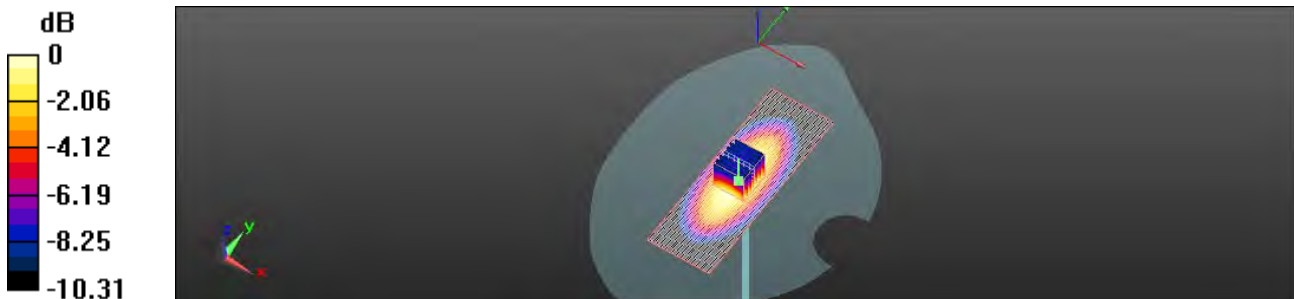
 $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$ 

Reference Value = 51.377 V/m; Power Drift = 0.0048 dB

Peak SAR (extrapolated) = 3.584 W/kg

**SAR(1 g) = 2.41 mW/g; SAR(10 g) = 1.57 mW/g**

Maximum value of SAR (measured) = 2.608 mW/g



0 dB = 2.610mW/g

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Date: 9/26/2011

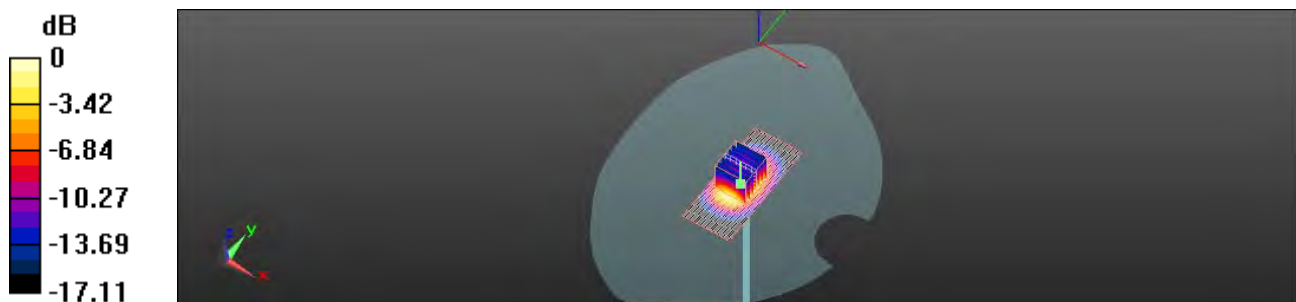
Communication System: CW; Frequency: 1900 MHz  
Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.415$  mho/m;  $\epsilon_r = 38.308$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section  
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)  
DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.78, 7.78, 7.78); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/d=10mm, Pin=250mW, dist=2mm:** Measurement grid:  
dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 12.118 mW/g

**Configuration/d=10mm, Pin=250mW, dist=2mm:** Measurement grid:  
dx=5mm, dy=5mm, dz=5mm  
Reference Value = 95.148 V/m; Power Drift = -0.06 dB  
Peak SAR (extrapolated) = 18.062 W/kg

**SAR(1 g) = 9.91 mW/g; SAR(10 g) = 5.19 mW/g**  
Maximum value of SAR (measured) = 11.209 mW/g



0 dB = 11.210mW/g

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Date: 9/26/2011

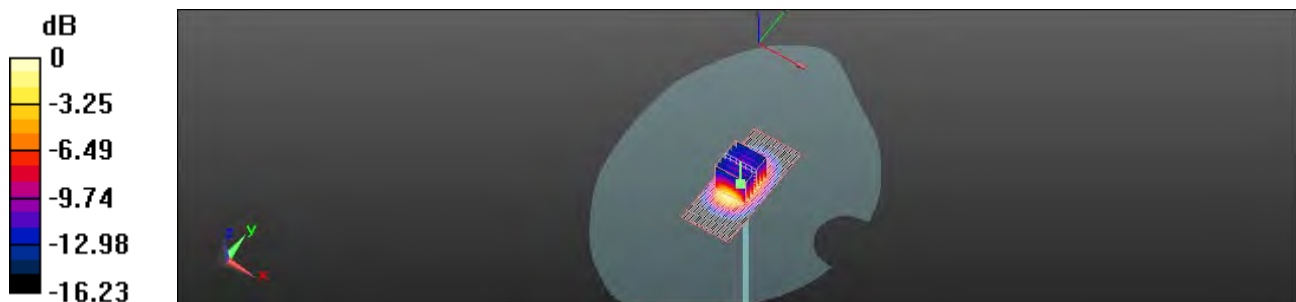
Communication System: CW; Frequency: 1900 MHz  
Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.523$  mho/m;  $\epsilon_r = 51.721$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section  
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)  
DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(7.51, 7.51, 7.51); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/d=10mm, Pin=250mW, dist=2mm:** Measurement grid:  
dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 11.863 mW/g

**Configuration/d=10mm, Pin=250mW, dist=2mm:** Measurement grid:  
dx=5mm, dy=5mm, dz=5mm  
Reference Value = 90.617 V/m; Power Drift = -0.0064 dB  
Peak SAR (extrapolated) = 16.576 W/kg

**SAR(1 g) = 9.62 mW/g; SAR(10 g) = 5.12 mW/g**  
Maximum value of SAR (measured) = 10.946 mW/g



0 dB = 10.950mW/g

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Date: 9/26/2011

Communication System: CW; Frequency: 2450 MHz

 Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.964$  mho/m;  $\epsilon_r = 51.592$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(6.96, 6.96, 6.96); Calibrated: 4/19/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/18/2011
- Phantom: SAM2; Type: SAM;
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

**Configuration/d=10mm, Pin=250mW, dist=2mm:** Measurement grid:

dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 16.243 mW/g

**Configuration/d=10mm, Pin=250mW, dist=2mm:** Measurement grid:

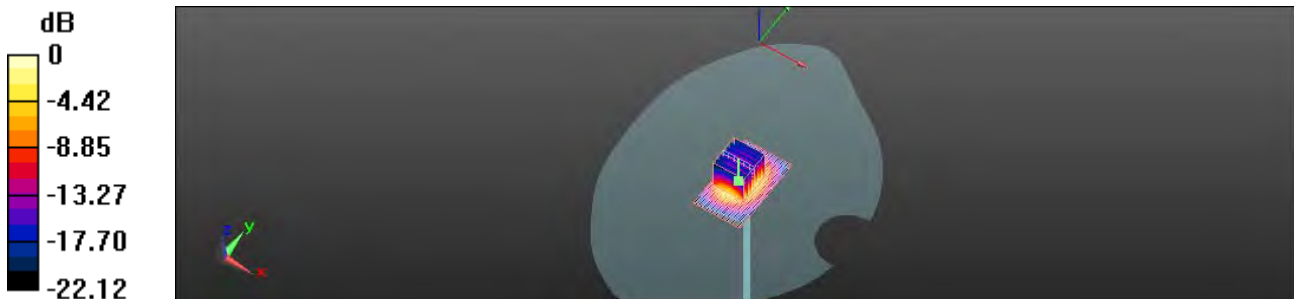
dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.877 V/m; Power Drift = 0.0043 dB

Peak SAR (extrapolated) = 29.009 W/kg

**SAR(1 g) = 13.6 mW/g; SAR(10 g) = 6.28 mW/g**

Maximum value of SAR (measured) = 15.251 mW/g



0 dB = 15.250mW/g

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## 6. DAE & Probe Calibration certificate

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



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S Servizio svizzero di taratura  
S Swiss Calibration Service

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client **SGS-TW (Auden)**

Certificate No: DAE4-856\_May11

### CALIBRATION CERTIFICATE

Object: DAE4 - SD 000 D04 BJ - SN: 856

Calibration procedure(s): QA CAL-06.v23  
Calibration procedure for the data acquisition electronics (DAE)

Calibration date: May 18, 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	07-Jun-10 (in house check)	In house check: Jun-11

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

Issued: May 18, 2011

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **SGS-TW (Auden)**

Certificate No: **EX3-3770\_Apr11**

## CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3770**

Calibration procedure(s) **QA CAL-01.v7, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v3  
Calibration procedure for dosimetric E-field probes**

Calibration date: **April 19, 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:	Katja Pokovic	Technical Manager	
Approved by:	Fin Bornholt	R&D Director	

Issued: April 19, 2011

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Certificate No: EX3-3770\_Apr11

Page 1 of 11

*Robert Chang*

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**Glossary:**

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

**Calibration is Performed According to the Following Standards:**

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

**Methods Applied and Interpretation of Parameters:**

- **NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\theta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not affect the E<sup>2</sup>-field uncertainty inside TSL (see below ConvF).
- **NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* 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  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* 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  $\pm 50$  MHz to  $\pm 100$  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 lip (on probe axis). No tolerance required.

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EX3DV4 – SN:3770

April 19, 2011

# Probe EX3DV4

## SN:3770

Manufactured: July 6, 2010  
Calibrated: April 19, 2011

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

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EX3DV4- SN:3770

April 19, 2011

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3770

### Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup>	0.32	0.62	0.40	$\pm 10.1\%$
DCP (mV) <sup>B</sup>	106.6	98.3	102.8	

### Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc <sup>E</sup> (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	120.8	$\pm 2.7\%$
			Y	0.00	0.00	1.00	134.3	
			Z	0.00	0.00	1.00	133.5	

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%.

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the  $E^2$ -field uncertainty inside TSL (see Pages 5 and 6).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

EX3DV4-SN:3770

April 19, 2011

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3770

### Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	9.58	9.58	9.58	0.80	0.70	± 12.0 %
835	41.5	0.90	9.25	9.25	9.25	0.80	0.67	± 12.0 %
900	41.5	0.97	9.06	9.06	9.06	0.76	0.71	± 12.0 %
1750	40.1	1.37	7.97	7.97	7.97	0.80	0.61	± 12.0 %
1900	40.0	1.40	7.78	7.78	7.78	0.71	0.62	± 12.0 %
2000	40.0	1.40	7.79	7.79	7.79	0.75	0.56	± 12.0 %
2450	39.2	1.80	6.99	6.99	6.99	0.80	0.56	± 12.0 %
2600	39.0	1.96	6.95	6.95	6.95	0.66	0.62	± 12.0 %

<sup>C</sup> 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.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) 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 ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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EX3DV4- SN:3770

April 19, 2011

## DASY/EASY - Parameters of Probe: EX3DV4- SN:3770

### Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	9.42	9.42	9.42	0.73	0.72	± 12.0 %
835	55.2	0.97	9.30	9.30	9.30	0.72	0.72	± 12.0 %
900	55.0	1.05	9.12	9.12	9.12	0.73	0.75	± 12.0 %
1750	53.4	1.49	7.84	7.84	7.84	0.80	0.68	± 12.0 %
1900	53.3	1.52	7.51	7.51	7.51	0.80	0.62	± 12.0 %
2000	53.3	1.52	7.44	7.44	7.44	0.80	0.66	± 12.0 %
2450	52.7	1.95	6.96	6.96	6.96	0.80	0.50	± 12.0 %
2600	52.5	2.16	6.78	6.78	6.78	0.80	0.50	± 12.0 %
5200	49.0	5.30	4.42	4.42	4.42	0.50	1.90	± 13.1 %
5300	48.9	5.42	4.12	4.12	4.12	0.52	1.90	± 13.1 %
5600	48.5	5.77	3.54	3.54	3.54	0.60	1.90	± 13.1 %
5800	48.2	6.00	3.80	3.80	3.80	0.60	1.90	± 13.1 %

<sup>C</sup> 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.

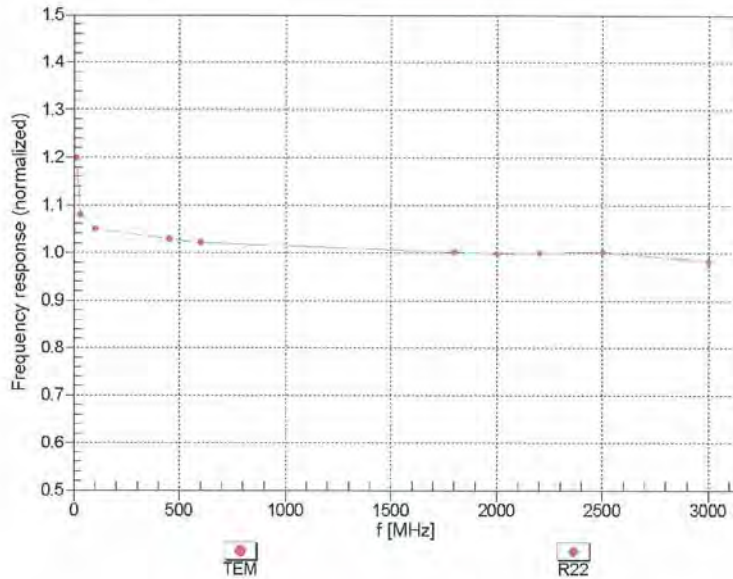
<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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April 19, 2011

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



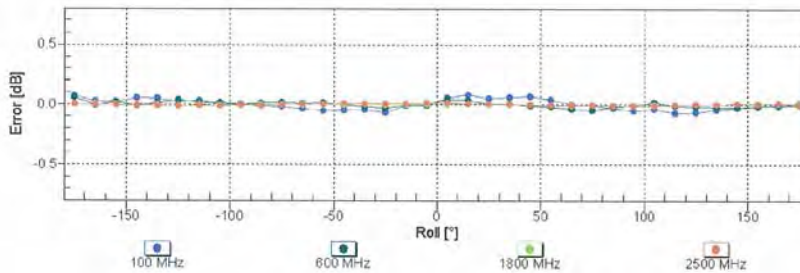
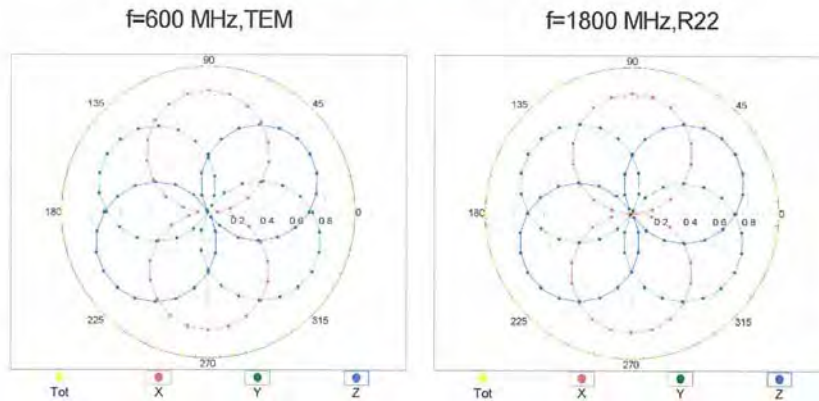
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  (k=2)

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



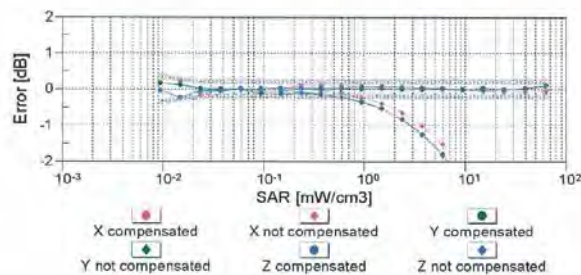
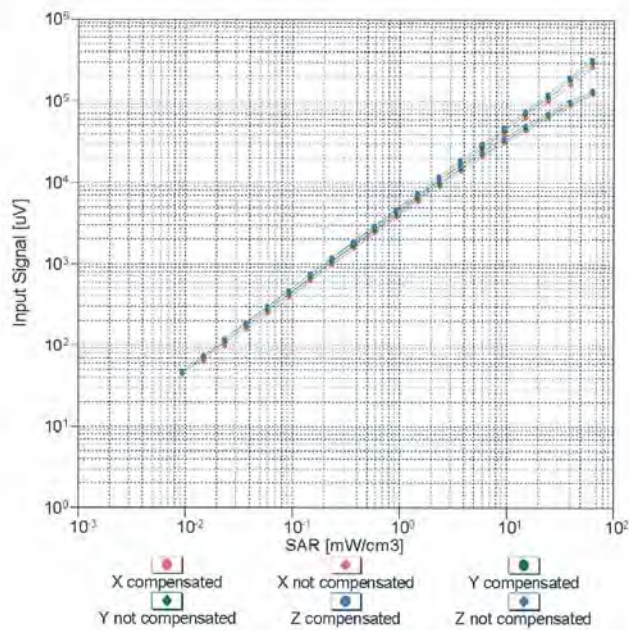
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

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April 19, 2011

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



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

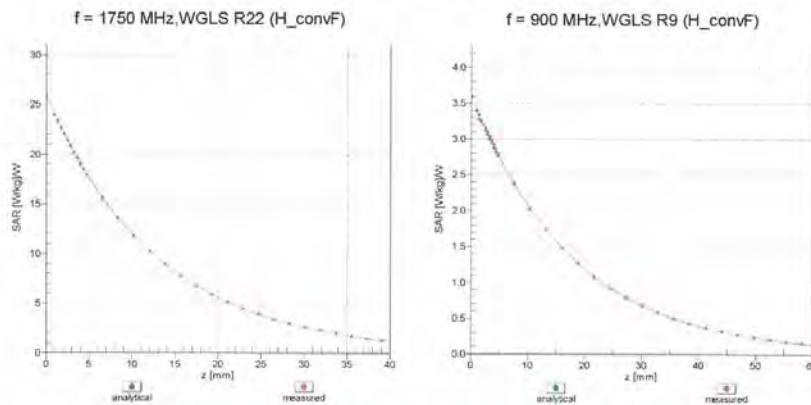
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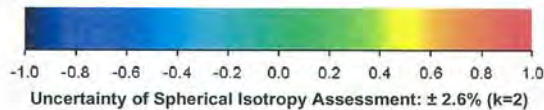
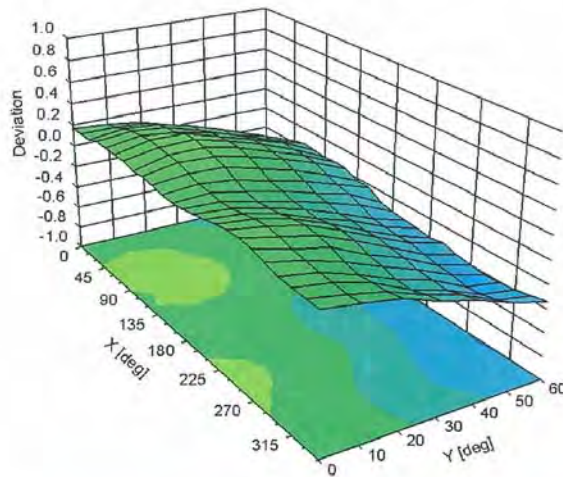
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### Conversion Factor Assessment



### Deviation from Isotropy in Liquid Error ( $\phi$ , $\theta$ ), $f = 900$ MHz



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## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3770

### 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

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## 7. Uncertainty Budget

Measurement Uncertainty evaluation template for DUT SAR test  
IEEE 1528

A	c	D	e	f	g	h=c * f / e	i=c * g / e	k
Source of Uncertainty	Tolerance/ Uncertainty %	Probability Distributioin	Div	ci (1g)	ci (10g)	Standard uncertainty	Standard uncertainty	vi, or Veff
<b>Measurement system</b>								
Probe calibration (Frequency below 2GHz)	6.0%	N	1	1	1	6.0%	6.0%	∞
<i>Isotropy, Axial</i>	4.7%	R	$\sqrt{3}$	1	1	2.7%	2.7%	∞
<i>Isotropy, Hemispherical</i>	9.6%	R	$\sqrt{3}$	1	1	5.5%	5.5%	∞
Boundary Effect	1.0%	R	$\sqrt{3}$	1	1	0.6%	0.6%	∞
Linearity	4.7%	R	$\sqrt{3}$	1	1	2.7%	2.7%	∞
Detection Limits	1.0%	R	$\sqrt{3}$	1	1	0.6%	0.6%	∞
Readout Electronics	0.3%	N	1	1	1	0.3%	0.3%	∞
Response time	0.8%	R	$\sqrt{3}$	1	1	0.5%	0.5%	∞
Integration Time	2.6%	R	$\sqrt{3}$	1	1	1.5%	1.5%	∞
<i>Measurement drift (class A evaluation)</i>	1.8%	R	$\sqrt{3}$	1	1	1.0%	1.0%	∞
RF ambient condition - noise	3.0%	R	$\sqrt{3}$	1	1	1.7%	1.7%	∞
RF ambient conditions -reflections	3.0%	R	$\sqrt{3}$	1	1	1.7%	1.7%	∞
Probe positioner Mechanical restrictions	0.4%	R	$\sqrt{3}$	1	1	0.2%	0.2%	∞
Probe Positioning with respect to phantom	2.9%	R	$\sqrt{3}$	1	1	1.7%	1.7%	∞
Post-processing	1.0%	R	$\sqrt{3}$	1	1	0.6%	0.6%	∞
Max SAR Eval	1.0%	R	$\sqrt{3}$	1	1	0.6%	0.6%	∞
<b>Test Sample related</b>								
Test sample	2.9%	N	1	1	1	2.9%	2.9%	M-1
Device Holder Uncertainty	3.6%	N	1	1	1	3.6%	3.6%	M-1
Drift of output power	5.0%	R	$\sqrt{3}$	1	1	2.9%	2.9%	∞
<b>Phantom and Setup</b>								
Phantom Uncertainty	4.0%	R	$\sqrt{3}$	1	1	2.3%	2.3%	∞
Liquid conductivity(meas.) Max at 1900 band	4.6%	N	1	0.64	0.43	2.9%	2.0%	M
Liquid permittivity(meas.) Max at 835 band	2.2%	N	1	0.6	0.49	1.3%	1.1%	M
Combined standard uncertainty		RSS				11.9%	11.6%	
Expant uncertainty (95% confidence interval), K=2						23.7%	23.3%	

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## 8. Phantom description

Schmid & Partner Engineering AG

**s p e a g**

Zeughausstrasse 43, 8004 Zurich, Switzerland  
Phone +41 1 245 9700, Fax +41 1 245 9779  
info@speag.com, http://www.speag.com

### Certificate of Conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 C
Series No	TP-1150 and higher
Manufacturer	SPEAG Zeughausstrasse 43 CH-8004 Zürich Switzerland

#### Tests

The series production process used allows the limitation to test of first articles. Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series items (called samples) or are tested at each item.

Test	Requirement	Details	Units tested
Dimensions	Compliant with the geometry according to the CAD model.	IT'IS CAD File (*)	First article, Samples
Material thickness of shell	Compliant with the requirements according to the standards	2mm +/- 0.2mm in flat and specific areas of head section	First article, Samples, TP-1314 ff.
Material thickness at ERP	Compliant with the requirements according to the standards	6mm +/- 0.2mm at ERP	First article, All items
Material parameters	Dielectric parameters for required frequencies	300 MHz – 6 GHz: Relative permittivity < 5, Loss tangent < 0.05	Material samples
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards if handled and cleaned according to the instructions. Observe technical Note for material compatibility.	DEGMBE based simulating liquids	Pre-series, First article, Material samples
Sagging	Compliant with the requirements according to the standards. Sagging of the flat section when filled with tissue simulating liquid.	< 1% typical < 0.8% if filled with 155mm of HSL900 and without DUT below	Prototypes, Sample testing

#### Standards

- [1] CENELEC EN 50361
- [2] IEEE Std 1528-2003
- [3] IEC 62209 Part I
- [4] FCC OET Bulletin 65, Supplement C, Edition 01-01

(\*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of the other documents.

#### Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standards [1] to [4].

Date 07.07.2005

Signature / Stamp

**s p e a g**

Schmid & Partner Engineering AG  
Zeughausstrasse 43, 8004 Zurich, Switzerland  
Phone +41 1 245 9700, Fax +41 1 245 9779  
info@speag.com, http://www.speag.com

Doc No 881 - QD 000 P40 C - F

Page 1 (1)

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## 9. System Validation from Original equipment supplier

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-TW (Auden)**

Certificate No: D835V2-4d063\_May11

### CALIBRATION CERTIFICATE

Object: D835V2 - SN: 4d063

Calibration procedure(s): QA CAL-05.v8  
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: May 25, 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: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	29-Apr-11 (No. ES3-3205_Apr11)	Apr-12
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-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-10)	In house check: Oct-11

Calibrated by: Name: Claudio Leubler, Function: Laboratory Technician, Signature: [Signature]

Approved by: Name: Katja Pokovic, Function: Technical Manager, Signature: [Signature]

Issued: May 25, 2011

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

Certificate No: D835V2-4d063\_May11

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**Calibration Laboratory of**  
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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**

**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	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

### Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.4 ± 6 %	0.88 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

### SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.31 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>9.34 mW / g ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.52 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>6.13 mW / g ± 16.5 % (k=2)</b>

### Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.9 ± 6 %	1.00 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

### SAR result with Body TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.43 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>9.45 mW / g ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.60 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>6.27 mW / g ± 16.5 % (k=2)</b>

## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.4 $\Omega$ - 1.5 j $\Omega$
Return Loss	- 28.9 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.7 $\Omega$ - 4.1 j $\Omega$
Return Loss	- 27.3 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.426 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	November 27, 2006



**DASY5 Validation Report for Head TSL**

Date: 25.05.2011

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d063**

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: HSL900

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.88$  mho/m;  $\epsilon_r = 40.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.07, 6.07, 6.07); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.4 Build (2829)

**Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Cube 0:**

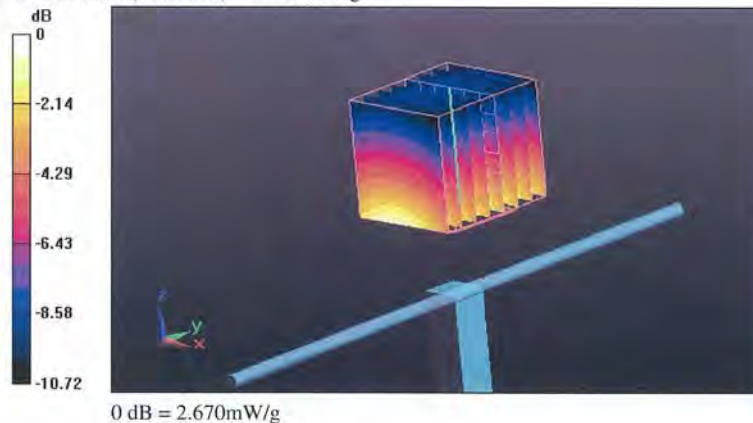
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.554 V/m; Power Drift = 0.03 dB

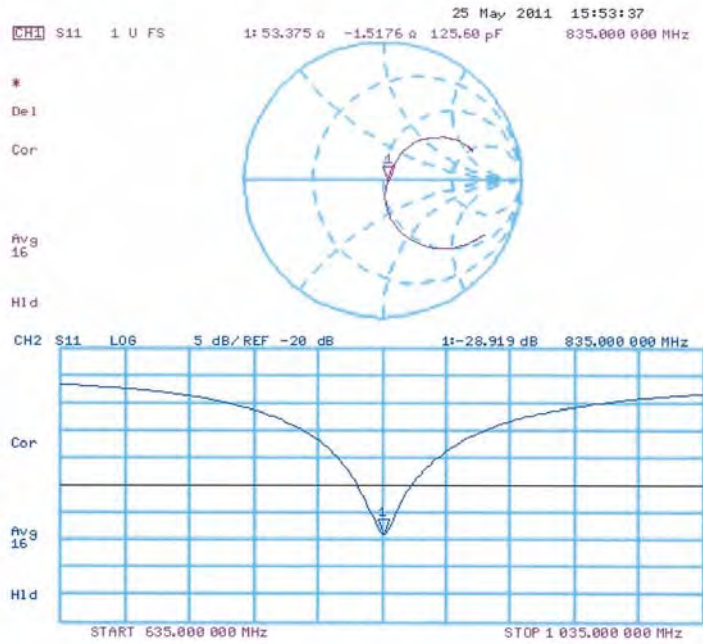
Peak SAR (extrapolated) = 3.427 W/kg

**SAR(1 g) = 2.31 mW/g; SAR(10 g) = 1.52 mW/g**

Maximum value of SAR (measured) = 2.669 mW/g



Impedance Measurement Plot for Head TSL



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**DASY5 Validation Report for Body TSL**

Date: 25.05.2011

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d063**

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: MSL900

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 1 \text{ mho/m}$ ;  $\epsilon_r = 53.9$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.02, 6.02, 6.02); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.4 Build (2829)

**Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Cube 0:**

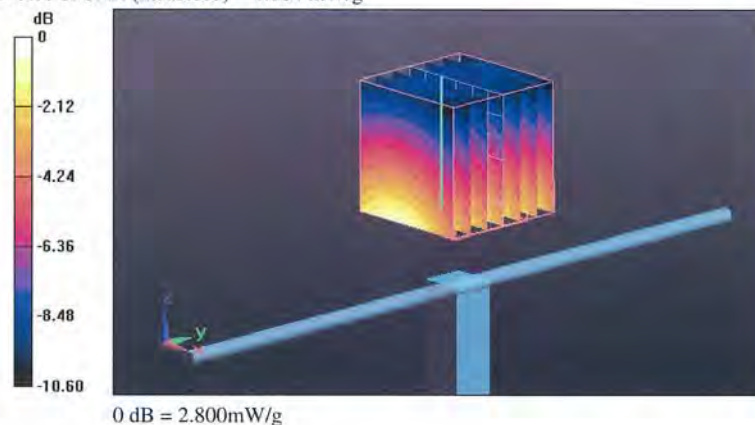
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 54.297 V/m; Power Drift = 0.06 dB

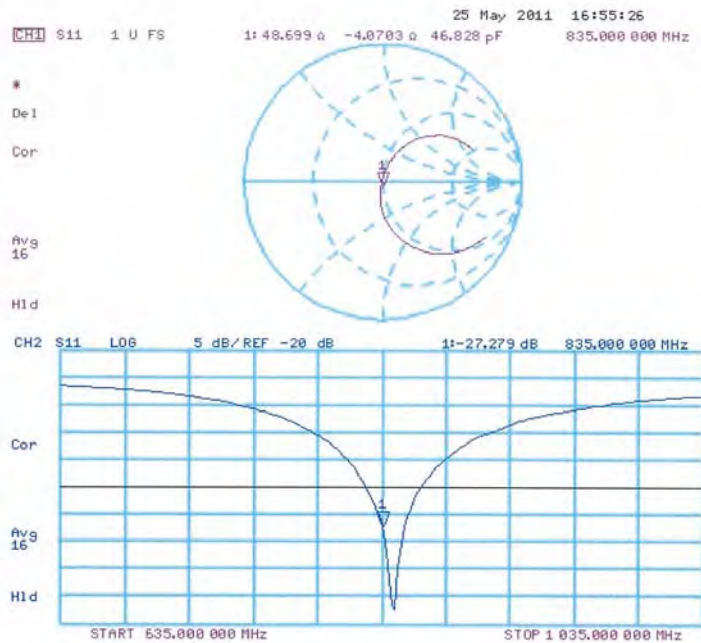
Peak SAR (extrapolated) = 3.530 W/kg

**SAR(1 g) = 2.43 mW/g; SAR(10 g) = 1.6 mW/g**

Maximum value of SAR (measured) = 2.804 mW/g



Impedance Measurement Plot for Body TSL



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **SGS TW (Auden)**

Certificate No: **D1900V2-5d027\_Apr11**

## CALIBRATION CERTIFICATE

Object: **D1900V2 - SN: 5d027**

Calibration procedure(s): **QA CAL-05.v8  
Calibration procedure for dipole validation kits**

Calibration date: **April 19, 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 ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-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-10)	In house check: Oct-11

Calibrated by: **Claudio Leubler** (Name), **Laboratory Technician** (Function), *[Signature]* (Signature)

Approved by: **Katja Pokovic** (Name), **Technical Manager** (Function), *[Signature]* (Signature)

Issued: April 19, 2011

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Certificate No: D1900V2-5d027\_Apr11

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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.

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**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, dz = 5 mm	
Frequency	1900 MHz $\pm$ 1 MHz	

**Head TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	38.9 $\pm$ 6 %	1.41 mho/m $\pm$ 6 %
Head TSL temperature during test	(21.0 $\pm$ 0.2) °C	---	---

**SAR result with Head TSL**

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.1 mW / g
SAR normalized	normalized to 1W	40.4 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>40.1 mW / g <math>\pm</math> 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.26 mW / g
SAR normalized	normalized to 1W	21.0 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>20.9 mW / g <math>\pm</math> 16.5 % (k=2)</b>

**Body TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.1 ± 6 %	1.52 mho/m ± 6 %
Body TSL temperature during test	(21.8 ± 0.2) °C	----	----

**SAR result with Body TSL**

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.93 mW / g
SAR normalized	normalized to 1W	39.7 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>39.4 mW / g ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.18 mW / g
SAR normalized	normalized to 1W	20.7 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>20.6 mW / g ± 16.5 % (k=2)</b>



## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.8 $\Omega$ + 6.4 $j\Omega$
Return Loss	- 23.7 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.1 $\Omega$ + 6.6 $j\Omega$
Return Loss	- 23.1 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.194 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	December 17, 2002

**DASY5 Validation Report for Head TSL**

Date/Time: 18.04.2011 15:27:22

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d027**

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: HSL U12 BB

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.41$  mho/m;  $\epsilon_r = 39$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.09, 5.09, 5.09); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2829)

**Pin=250 mW, Cube 0:**

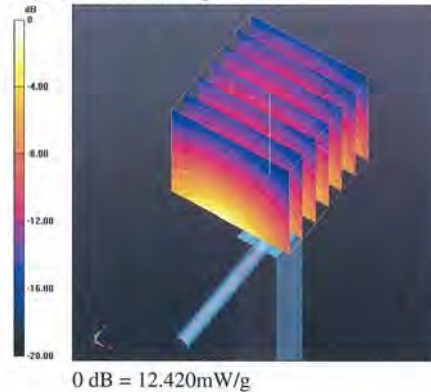
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.235 V/m; Power Drift = 0.05 dB

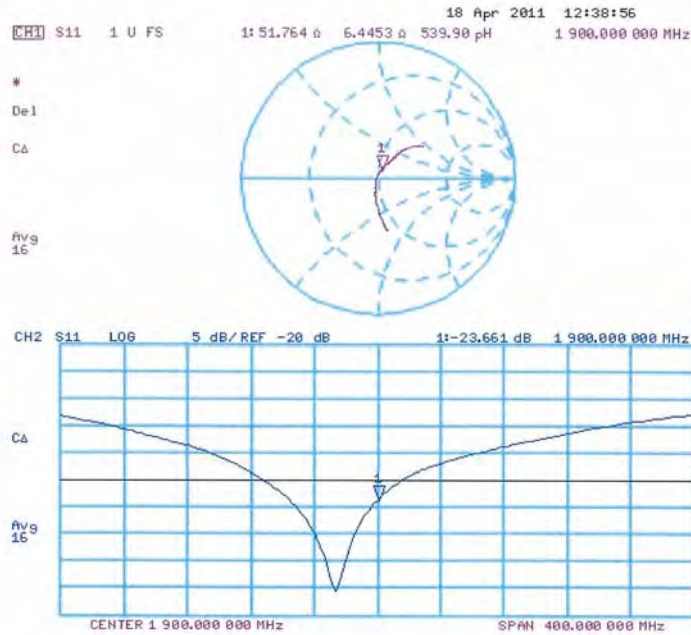
Peak SAR (extrapolated) = 18.650 W/kg

**SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.26 mW/g**

Maximum value of SAR (measured) = 12.424 mW/g



Impedance Measurement Plot for Head TSL



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**DASY5 Validation Report for Body TSL**

Date/Time: 19.04.2011 12:53:51

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d027**

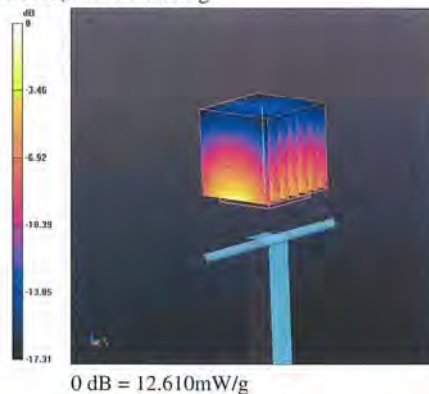
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1  
Medium: MSL U12 BB  
Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.52$  mho/m;  $\epsilon_r = 51.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section  
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

**DASY5 Configuration:**

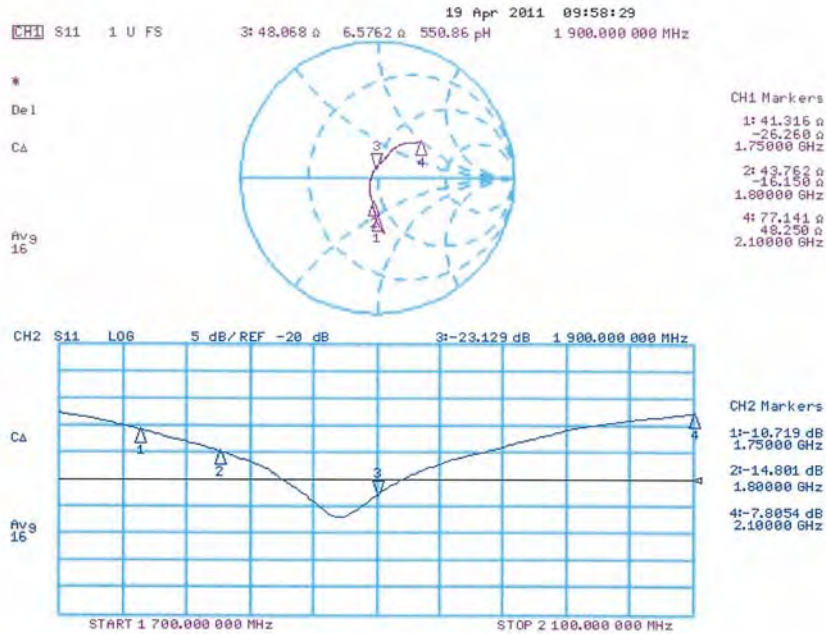
- Probe: ES3DV3 - SN3205; ConvF(4.59, 4.59, 4.59); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2829)

**Pin=250 mW, Cube 0:**

Measurement grid: dx=5mm, dy=5mm, dz=5mm  
Reference Value = 96.170 V/m; Power Drift = 0.01 dB  
Peak SAR (extrapolated) = 17.156 W/kg  
**SAR(1 g) = 9.93 mW/g; SAR(10 g) = 5.18 mW/g**  
Maximum value of SAR (measured) = 12.615 mW/g



## Impedance Measurement Plot for Body TSL



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **SGS TW (Auden)**

Certificate No: **D2450V2- 727\_Apr11**

## CALIBRATION CERTIFICATE

Object: **D2450V2 - SN: 727**

Calibration procedure(s): **QA CAL-05.v8  
Calibration procedure for dipole validation kits**

Calibration date: **April 19, 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 ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-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-10)	In house check: Oct-11

Calibrated by: **Claudio Leubler** (Name), **Laboratory Technician** (Function), *[Signature]* (Signature)

Approved by: **Katja Pokovic** (Name), **Technical Manager** (Function), *[Signature]* (Signature)

Issued: April 19, 2011

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**Calibration Laboratory of**  
Schmid & Partner  
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**S** Schweizerischer Kalibrierdienst  
**C** Service suisse d'étalonnage  
**S** Servizio svizzero di taratura  
**S** Swiss Calibration Service

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**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.

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### 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, dz = 5 mm	
Frequency	2450 MHz $\pm$ 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 $\pm$ 0.2) °C	38.7 $\pm$ 6 %	1.72 mho/m $\pm$ 6 %
Head TSL temperature during test	(21.0 $\pm$ 0.2) °C	----	----

### SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.7 mW / g
SAR normalized	normalized to 1W	54.8 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	55.8 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.39 mW / g
SAR normalized	normalized to 1W	25.6 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	25.7 mW / g $\pm$ 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	50.6 ± 6 %	1.91 mho/m ± 6 %
Body TSL temperature during test	(21.5 ± 0.2) °C	---	---

### SAR result with Body TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.7 mW / g
SAR normalized	normalized to 1W	50.8 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>50.8 mW / g ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.84 mW / g
SAR normalized	normalized to 1W	23.4 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>23.3 mW / g ± 16.5 % (k=2)</b>

## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.3 $\Omega$ + 2.0 $j\Omega$
Return Loss	- 26.9 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.9 $\Omega$ + 3.7 $j\Omega$
Return Loss	- 28.6 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.149 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	January 9, 2003

**DASY5 Validation Report for Head TSL**

Date/Time: 18.04.2011 16:55:19

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:727**

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: HSL U12 BB

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.74$  mho/m;  $\epsilon_r = 38.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

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: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2829)

**Pin=250 mW, Cube 0:**

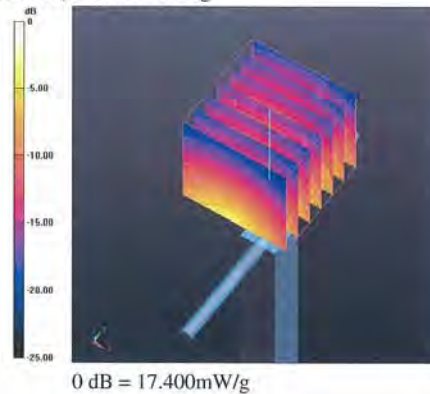
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 103.6 V/m; Power Drift = 0.04 dB

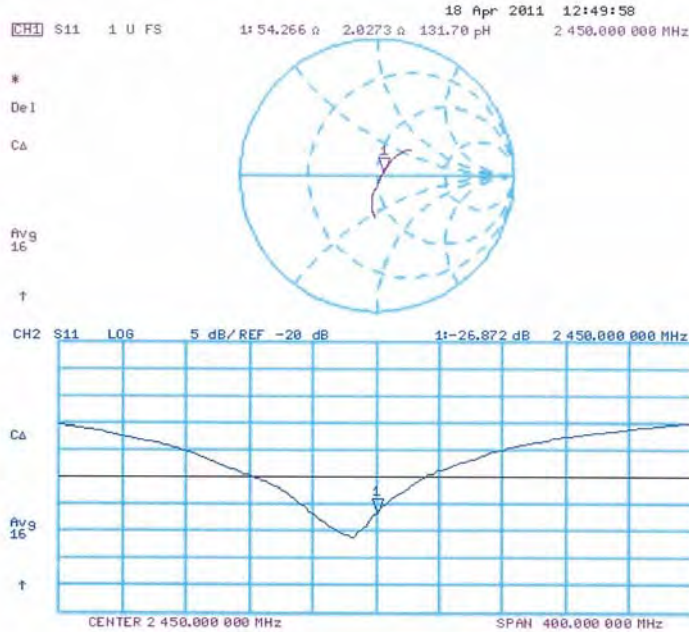
Peak SAR (extrapolated) = 27.919 W/kg

**SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.39 mW/g**

Maximum value of SAR (measured) = 17.401 mW/g



Impedance Measurement Plot for Head TSL



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**DASY5 Validation Report for Body TSL**

Date/Time: 19.04.2011 14:37:11

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:727**

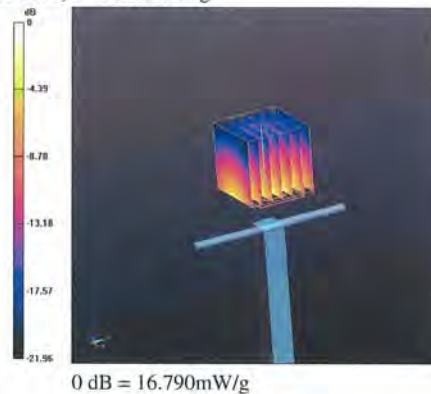
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1  
Medium: MSL U12 BB  
Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.91$  mho/m;  $\epsilon_r = 50.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section  
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

**DASY5 Configuration:**

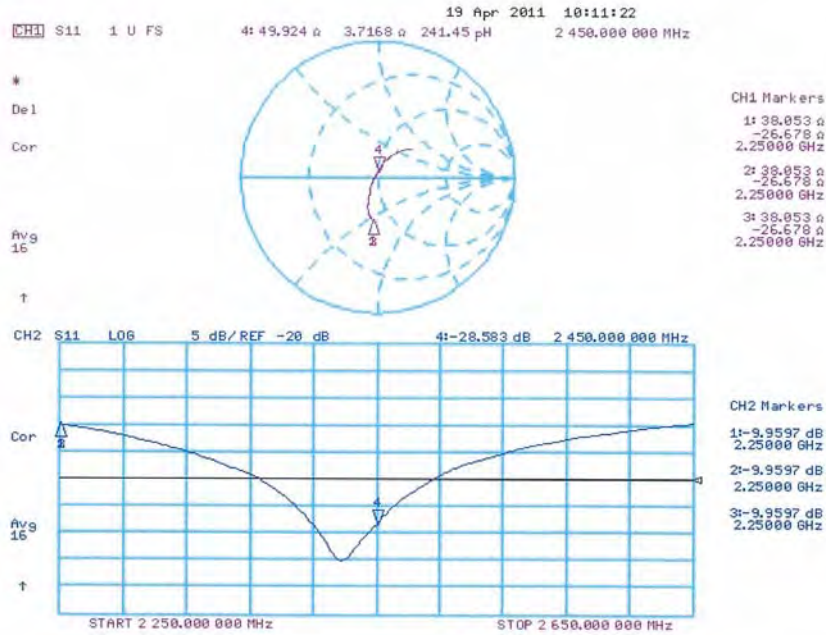
- Probe: ES3DV3 - SN3205; ConvF(4.31, 4.31, 4.31); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY52, V52.6.2 Build (424)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2829)

**Pin=250 mW, Cube 0:**

Measurement grid: dx=5mm, dy=5mm, dz=5mm  
Reference Value = 96.949 V/m; Power Drift = -0.04 dB  
Peak SAR (extrapolated) = 26.888 W/kg  
**SAR(1 g) = 12.7 mW/g; SAR(10 g) = 5.84 mW/g**  
Maximum value of SAR (measured) = 16.794 mW/g



Impedance Measurement Plot for Body TSL



## End of 1<sup>st</sup> part of report

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