SAR TEST REPORT

Equipment Under Test	Mini-PCIe wireless WAN (F3307) card INSTALLED IN AN HP HSTNN-F05C SERIES LAPTOP
Model Number	HSTNN-F05C
Company Name	Ericsson AB
Company Address	Lindholmspiren 11 Gothenburg, Sweden SE-41756
FCC ID	VV7-MBMF33071-H
Date of Receipt	2010.09.17
Date of Test(s)	2010.10.04
Date of Issue	2010.10.25

Standards:

FCC OET 65 supplement C,
IEEE /ANSI C95.1 , C95.3, IEEE 1528 ,KDB 616217

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

Remarks:

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS Taiwan Electronic & Communication Laboratory or testing done by SGS Taiwan Electronic & Communication Laboratory in connection with distribution or use of the product described in this report must be approved by SGS Taiwan Electronic & Communication Laboratory in writing.

Tested by : Ricky Huang Ricky Huang **Date : 2010.10.25**
Asst. Supervisor

Approved by : Nick Hsu Nick Hsu **Date : 2010.10.25**
Supervisor

Version

Version No.	Date	Description
1.0	Oct. 07, 2010	Initial issue of report
1.1	Oct. 25, 2010	1st modification

Contents

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

1.2 Details of Applicant

Name	Ericsson AB
Address	Lindholmspiren 11 Gothenburg, Sweden SE-41756

1.3 Description of EUT

Product Name	Mini-PCIe wireless WAN (F3307) card INSTALLED IN AN HP HSTNN-F05C SERIES LAPTOP	
Model Number	HSTNN-F05C	
Definition	Production unit	
Mode of Operation	GSM\GPRS\EGPRS\WCDMA\HSDPA\HSUPA band	
Duty Cycle	GPRS(EGPRS)	WCDMA
	1/4	1

TX Frequency range (MHz)	GPRS 850	GPRS 1900	WCDMA B2	WCDMA B5
	824.2-848.8	1850.20-1909.80	1852.40-1907.60	826.40-846.60
Channel Number (ARFCN)	GPRS 850	GPRS 1900	WCDMA B2	WCDMA B5
	128-251	512- 810	9262- 9538	4132- 4233
IMEI CODE	351912040001910			
Antenna-to-user separation	185mm			
Max. SAR Measured (1g)	**0.063W/kg** (At GPRS850_ CH251_ Configuration 1)			

Note: 1. The highest 1-g SAR for WLAN is 0.193 W/kg and the highest 1-g SAR for WWAN is 0.063W/kg. The sum of 1-g for simultaneous transmitting WLAN and WWAN antenna pair is 0.193+0.063 = 0.256 W/kg < 1.6 W/kg. According to KDB616217 Simultaneous SAR evaluation is not required.

Report No.	09U12862-3	10U13089-1A	EN/2010/60004	10U13048-1A
FCC ID	QDS-BRCM1050	QDS-BRCM1050	VQF-RT3090BC4	PPD-AR5B195
Max.SAR Measured (1g)	0.00408 W/kg	0.193 W/kg	0.042 W/kg	0.037 W/kg

2. The conducted power was measured per 3GPP 34.121 procedures for UMTS, 3GPP2 C.S0011 for 1x, and TS51.010-1 for GPRS.

Conducted power:

	GSM 850 (Average)			GSM 1900 (Average)		
Mode\ARFCN	128	190	251	512	661	810
GPRS 10 (2UL slot)	32	32.1	32.1	28.6	28.3	28.1
EGPRS 10 (2UL slot)	27.1	27.3	27.4	25.7	25.5	25.2

#. F3307 Module does not allow power reduction for 1UL and 2UL transmission modes. The module is capable of multi-slot Class 10 (2UL max).

#. Average power results are maximum burst average over an 8-slot period.

		WCDMA Band V Channel			WCDMA Band II Channel		
Mode	**Subtest**	**4132**	**4182**	**4233**	**9262**	**9400**	**9538**
Rel99	R99	23.35	23.42	23.41	22.71	22.66	22.57
Rel6 HSDPA	1	23.14	23.28	23.53	22.88	22.55	22.43
	2	23.28	23.31	23.28	22.59	22.52	22.42
	3	22.68	22.8	23.04	22.4	22.1	21.9
	4	22.73	22.84	23.1	22.47	22.11	22.02
Rel6 HSUPA	1	23.31	23.35	23.33	22.63	22.64	22.51
	2	21.37	21.43	21.37	20.68	20.71	20.55
	3	22.35	22.41	22.41	21.69	21.66	21.59
	4	21.42	21.49	21.45	20.81	20.76	20.59
	5	23.17	23.18	23.22	22.52	22.5	22.42

SGS Taiwan Ltd. No.134, Wu Kung Road, Wuku Industrial Zone, Taipei County, Taiwan / 台北縣五股工業區五工路 134 號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

1.4 Antenna information and Test Reduction Analysis

SAR measurements were completed for the technology with the highest measured average transmit power for each operational band of the module. accordance with the following KDB references:

- Per KDB941225 FCC 3G procedures, HSDPA and HSUPA have been omitted since the maximum transmit power results are less than the R99 test results.
- Per KDB KDB941225 D03 procedures, EGPRS/EDGE have been omitted since the maximum transmit power results are less than the GPRS test results.
- Per KDB941225 D01, page 6, paragraph 2: "…As an increasing number of data modes and configurations are introduced in the new generation of 3G devices, certain tests could become redundant or unnecessary. Since SAR measurements are usually quite time consuming, it would be advantageous to consider output power as a pre-screening tool to determine the SAR test that are necessary, according to a larger subset of the device configurations, to demonstrate compliance.…"

1.5 Test Environment

Ambient Temperature: 22±2° C
Tissue Simulating Liquid: 22±2° C

1.6 EUT configuration

Conducted transmit power is tested at low, mid, and high channels per the procedures documented below.

1.6.1 SAR system Crest Factor Settings

GPRS 2UL Slots = 4.1
UMTS= 1

1.6.2 For WCDMA / HSDPA / HSUPA

Configure the call box to support all WCDMA tests in respect to the 3GPP 34.121.
Rel99

1) Set a Test Mode 1 loop back with a 12.2kbps Reference Measurement Channel (RMC)
2) Set and send continuously Up power control commands to the F3307 module.

HSDPA Rel 6

1) Establish a Test Mode 1 look back with both 1 12.2kbps RMC channel and a H-Set1 Fixed Reference Channel (FRC). With the 8820 this is accomplished by setting the signal Channel Coding to "Fixed Reference Channel" and configuring for HSET-1 QKSP.
2) Set beta values and HSDPA settings for HSDPA Sebtest1 according to Table 1.6-3
3) Send continuously Up power control commands to the Gobi2000 module
4) Measure the power at the F3307 module's antenna connector using the power meter with modulated average detector
5) Repeat the measurement for the HSDPA Subtest2, 3 and 4 as given in Table 1.6-3

SGS Taiwan Ltd. No.134, Wu Kung Road, Wuku Industrial Zone, Taipei County, Taiwan / 台北縣五股工業區五工路 134 號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

HSUPA Rel 6

1) Use UL RMC 12.2kbps and FRC H-Set1 QPSK, Test Mode 1 loop back. With the 8820 this is accomplished by setting the signal Channel Coding to "E-DCH Test Channel" and configuring the equipment category to Cat6_10ms.
2) Set the Absolute Grant for HSUPA Subtest1 according to Table 1.6-3
3) Set the F3307 module power to be at least 5dB lower than the Maximum output power
4) Send power control bits to give one TPC_cmd = +1 command to the F3307 module. If the F3307 module doesn't send any E-DPCH data with decreased E-TFCI within 500ms, then repeat this process until the decreased E-TFCI is reported.
5) Confirm that the E-TFCI transmitted by the F3307 module is equal to the target E-TFCI in Table 1.6-3. If the E-TFCI transmitted by the F3307 module is not equal to the target E-TFCI, then send power control bits to give one TPCcmd = -1 command to the UE. If UE sends any E-DPCH data with decreased E-TFCI within 500 ms, send new power control bits to give one TPC_cmd = -1 command to the UE. Then confirm that the E-TFCI transmitted by the UE is equal to the target E-TFCI in Table 1.6-3. If the E-TFCI transmitted by the UE is not equal to the target E-TFCI, then fail the UE
6) Repeat the measurement for the HSUPA Subtest2, 3, 4 as given in Table 1.6-3
7) For subtest 5, set TPC to all up bits

Table 1.6-1 3GPP Rel99 / HSPA Subtest Settings

	Mode	Rel99	Rel6 HSDPA	Rel6 HSDPA	Rel6 HSDPA	Rel6 HSDPA	Rel6 HSUPA	Rel6 HSUPA	Rel6 HSUPA	Rel6 HSUPA	Rel6 HSUPA
	Subtest	**-**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**5**
WCDMA General Settings	Loopback Mode	Test Mode 1	Test Mode 1				Test Mode 1				
	Rel99 RMC	12.2kbps RMC	12.2kbps RMC				12.2kbps RMC				
	HSDPA FRC	Not Applicable	H-Set1				H-Set1				
	HSUPA Test	Not Applicable	Not Applicable				HSUPA Loopback				
	Power Control Algorithm	Algorithm2	Algorithm2				Algorithm2				
	βc	Not Applicable	2/15	12/15	15/15	15/15	11/15	6/15	15/15	2/15	15/15
	βd	Not Applicable	15/15	15/15	8/15	4/15	15/15	15/15	9/15	15/15	15/15
	βec	Not Applicable	-	-	-	-	209/225	12/15	30/15	2/15	24/15
	βc/βd	8/15	2/15	12/15	15/8	15/4	11/15	6/15	15/9	2/15	15/15
	βhs	Not Applicable	4/15	24/15	30/15	30/15	22/15	12/15	30/15	4/15	30/15
	βed	Not Applicable	Not Applicable				1309/225	94/75	47/15 47/15	56/75	134/15
HSDPA Specific Settings	DACK	Not Applicable	8				8				
	DNAK	Not Applicable	8				8				
	DCQI	Not Applicable	8				8				
	Ack-Nack repetition factor	Not Applicable	3				3				
	CQI Feedback (Table 5.2B.4)	Not Applicable	4ms				4ms				
	CQI Repetition Factor (Table 5.2B.4)	Not Applicable	2				2				
	Ahs = βhs/βc	Not Applicable	30/15				30/15				
HSUPA Specific Settings	D E-DPCCH	Not Applicable	Not Applicable				6	8	8	5	7
	DHARQ	Not Applicable	Not Applicable				0	0	0	0	0
	AG Index	Not Applicable	Not Applicable				20	12	15	17	21
	ETFCI (from 34.121 Table C.11.1.3)	Not Applicable	Not Applicable				75	67	92	71	81
	Associated Max UL Data Rate kbps	Not Applicable	Not Applicable				242.1	174.9	482.8	205.8	308.9

SGS Taiwan Ltd. No.134, Wu Kung Road, Wuku Industrial Zone, Taipei County, Taiwan / 台北縣五股工業區五工路 134 號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

	Mode	Rel99	Rel6 HSDPA	Rel6 HSDPA	Rel6 HSDPA	Rel6 HSDPA	Rel6 HSUPA	Rel6 HSUPA	Rel6 HSUPA	Rel6 HSUPA	Rel6 HSUPA
	Subtest	**-**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**5**
	Reference E_TFCIs	Not Applicable	Not Applicable				E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27		E-TFCI 11 E-TFCI PO 4 E-TFCI 92 E-TFCI PO 18	E-TFCI 11 E-TFCI PO 4 E-TFCI 67 E-TFCI PO 18 E-TFCI 71 E-TFCI PO 23 E-TFCI 75 E-TFCI PO 26 E-TFCI 81 E-TFCI PO 27	

SGS Taiwan Ltd. No.134, Wu Kung Road, Wuku Industrial Zone, Taipei County, Taiwan / 台北縣五股工業區五工路 134 號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

1.6.3 Call set-up For GSM / GPRS / EGDE

Conducted transmit power and SAR was tested for GPRS (GMSK modulation) modes only. EDGE is not tested since the transmit power is much lower per the module level certification for VV7-MBMF33071-H.

The reported transmit power is "average power", also referenced as frame average power. Burst average power is not reported as this just reports the peak power during the transmitted slot and does not represent the average power over the GPRS 8 time slots. In addition to the declaration that power reduction is not used for any GPRS slot configurations, the average power measurements in this report show that GPRS 2UL slots is representative of the maximum average transmit power and is the applicable mode for SAR testing.

- Configure the call box to support GPRS test.
- Configure for desired number of uplink transmit lots (multislot 1 or 2)
- Set for the desired frequency
- Set MS_TX level to 0 (850 MHz) or 2 (1900MHz) to configure EUT to transmit at maximum output power.

The EUT was tested in the following orientation:

Configuration 1: Lap-held mode. (Bottom side of the notebook is parallel with flat phantom, LCD panel open to 90 degrees, bottom side in contact with flat phantom.), see Appendix-Fig.4

The F3307 Module only transmits via the WWAN main antenna; the WWAN AUX antenna is receive-only and therefore was not tested.

SGS Taiwan Ltd. No.134, Wu Kung Road, Wuku Industrial Zone, Taipei County, Taiwan / 台北縣五股工業區五工路 134 號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

1.7 The SAR Measurement System

A photograph of the SAR measurement System is given in Fig. a. This SAR Measurement System uses a Computer-controlled 3-D stepper motor system (SPEAG DASY 4 professional system). A Model ES3DV3 field probe is used to determine the internal electric fields. The SAR can be obtained from the equation SAR= $\sigma (|Ei|^2)/ \rho$ where σ and ρ are the conductivity and mass density of the tissue-simulant.

The DASY4 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Staubli RX family) with controller, teach pendant and software. An arm extension 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.

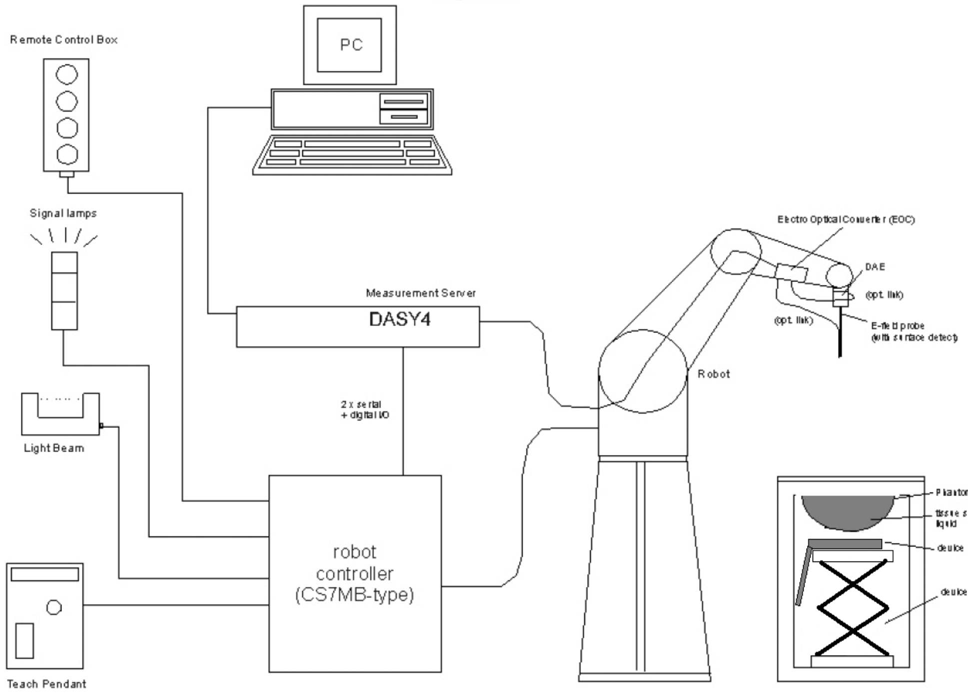


Fig.a The block diagram of SAR system

- The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
  - A computer operating Windows 2000 or Windows XP.
  - DASY4 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
  - The SAM twin phantom enabling testing 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.

1.8 System Components

ES3DV3 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 HSL850 & 1900 MHZ Additional CF for other liquids and frequencies upon request
Frequency	10 MHz to > 4 GHz, Linearity: ± 0.2 dB (30 MHz to 4 GHz)
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	10 µW/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 µW/g)
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 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%.

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: 251 mm; Length: 1000 mm; Width: 500 mm	

DEVICE HOLDER

Construction	The device holder (Supporter) for Notebook is made by POM (polyoxymethylene resin) , which is non-metal and non-conductive. The height can be adjusted to fit varies kind of notebooks.	 Device Holder

1.9 SAR System Verification

The microwave circuit arrangement for system verification is sketched in Fig. b. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within +/- 10% from the target SAR values. These tests were done at 850&1900 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 (SAR values are normalized to 1W forward power delivered to the dipole). 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 in the flat section was 15 cm in all cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.

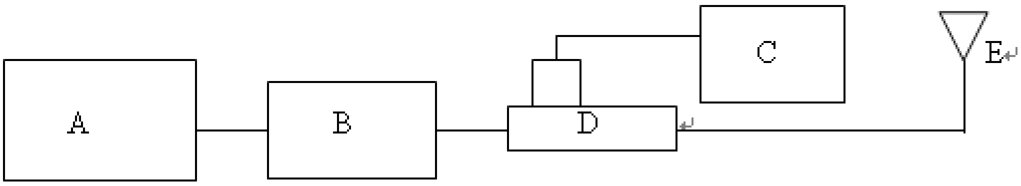
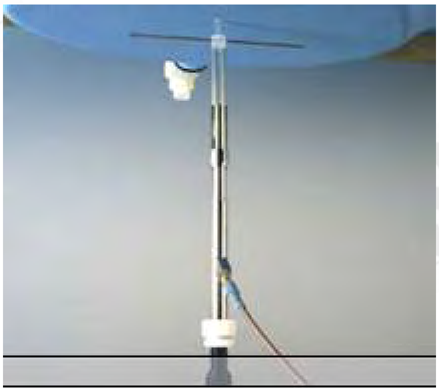


Fig.b The block diagram of system verification

A. Agilent Model 8648D Signal Generator
B. Mini circuits Model ZHL-42 Amplifier
C. Agilent Model U2001B Power Sensor
D. Agilent Model 778D Dual directional coupling
E. Reference dipole antenna



Photograph of the dipole Antenna

SGS Taiwan Ltd. No.134, Wu Kung Road, Wuku Industrial Zone, Taipei County, Taiwan / 台北縣五股工業區五工路 134 號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Validation Kit	Frequency Hz	Target SAR (1g) (Pin=250mW)	Measured SAR (1g)	Measured Date
D835V2 S/N: 4d063	850 MHz (Body)	2.53m W/g	2.62 m W/g	2010-10-04
D1900V2 S/N: 5d027	1900 MHz (Body)	10.1m W/g	10.3m W/g	2010-10-04

Table 1. Results of system validation

1.10 Tissue Simulant Fluid for the Frequency Band

The dielectric properties for this body-simulant fluid were measured by using the HP Model 85070D Dielectric Probe (rates frequency band 200 MHz to 20 GHz) in conjunction with HP 8753D Network Analyzer (30 KHz-6000 MHz) 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 liquid depth in the flat section was 15 cm in all cases. (Fig .2)

Frequency (MHz)	Tissue type	Measurement date/ Limits	Dielectric Parameters		
			ρ	σ (S/m)	Simulated Tissue Temperature(° C)
850	Body	Measured, 2010.10.04	54.3	0.978	21.7
		Recommended Limits	51.49-57.33	0.93-1.03	20-24
1900	Body	Measured, 2010.10.04	53.2	1.58	21.7
		Recommended Limits	52.06-57.54	1.45-1.61	20-24

Table 2. Dielectric Parameters of Tissue Simulant Fluid

The composition of the body tissue simulating liquid is:

Ingredient	850MHz (Body)	1900MHz (Body)
DGMBE	X	300.67g
Water	631.68 g	716.56 g
Salt	11.72 g	4.0 g
Preventol D-7	1.2 g	X
Cellulose	X	X
Sugar	600 g	X
Total amount	1 L (1.0kg)	1 L (1.0kg)

Table 3. Recipes for tissue simulating liquid

1.11 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 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.

SGS Taiwan Ltd. No.134, Wu Kung Road, Wuku Industrial Zone, Taipei County, Taiwan / 台北縣五股工業區五工路 134 號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

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.

1.12 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

SGS Taiwan Ltd. No.134, Wu Kung Road, Wuku Industrial Zone, Taipei County, Taiwan / 台北縣五股工業區五工路 134 號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

W/kg, as averaged over an 10 grams of tissue (defined as a tissue volume in the shape of a cube).

(2) 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.

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

Human Exposure	**Uncontrolled Environment General Population**	**Controlled Environment Occupational**
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.

SGS Taiwan Ltd. No.134, Wu Kung Road, Wuku Industrial Zone, Taipei County, Taiwan / 台北縣五股工業區五工路 134 號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

2. Summary of Results

GPRS 850(GPRS mode)_2UL slot

Configuration 1: Lap-held mode.

Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[°C]	Liquid Temp[°C]
850MHz	128	824.2	32 dBm	0.048	22.1	21.7
	190	836.6	32.1 dBm	0.062	22.1	21.7
	251	848.8	32.1 dBm	0.063	22.1	21.7

GPRS 1900(GPRS mode)_2UL slot

Configuration 1: Lap-held mode.

Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[°C]	Liquid Temp[°C]
1900MHz	512	1850.2	28.6 dBm	0.034	22.1	21.7
	661	1880	28.3 dBm	0.017	22.1	21.7
	810	1909.8	28.1 dBm	0.00968	22.1	21.7

WCDMA B2 (R99 mode)

Configuration 1: Lap-held mode.

Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[°C]	Liquid Temp[°C]
1900MHz	9262	1852.4	22.71 dBm	0.031	22.1	21.7
	9400	1880.0	22.66 dBm	0.032	22.1	21.7
	9538	1907.6	22.57 dBm	0.019	22.1	21.7

WCDMA B5 (R99 mode)

Configuration 1: Lap-held mode.						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[˚C]	Liquid Temp[˚C]
850MHz	4132	826.4	23.35 dBm	0.019	22.1	21.7
	4183	836.6	23.42dBm	0.024	22.1	21.7
	4233	846.6	23.41 dBm	0.023	22.1	21.7

SAR measurement results with transmitter at maximum output power.

3. Instruments List

Manufacturer	Device	Type	Serial number	Date of last calibration
Schmid & Partner Engineering AG	Dosimetric E-Field Probe	ES3DV3	3172	May.21.2010
Schmid & Partner Engineering AG	850 &1900 MHz System Validation Dipole	D835V2	4d063	May.21.2010
		D1900V2	5d027	Apr.28.2010
Schmid & Partner Engineering AG	Data acquisition Electronics	DAE4	547	Aug.18.2010
Schmid & Partner Engineering AG	Software	DASY 4 V4.7 Build 80	N/A	Calibration not required
Schmid & Partner Engineering AG	Phantom	SAM	N/A	Calibration not required
HP	Network Analyzer	8753D	3410A05662	Mar.30.2010
HP	Dielectric Probe Kit	85070D	US01440168	Calibration not required
Agilent	Dual-directional coupler	778D	50313	Aug.26.2009
Agilent	RF Signal Generator	8648D	3847M00432	Jun.04.2010
Agilent	Power Sensor	U2001B	MY48100169	Apr.30.2010
R&S	Radio Communication Test	CMU200	113505	Mar.25.2010

4. Measurements

Date: 2010/10/4

Configuration 1_GPRS850_CH128

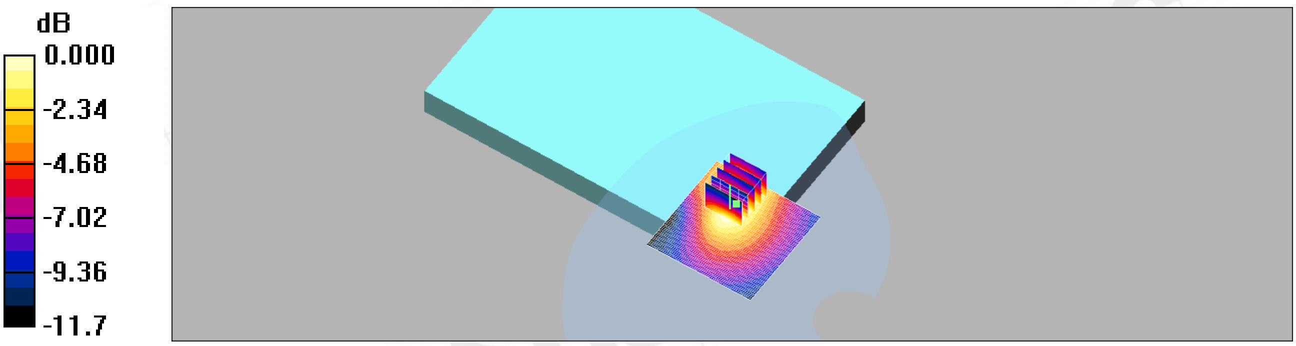
DUT: HSTNN-F05C;

Communication System: GSM 850; Frequency: 824.2 MHz;Duty Cycle: 1:4.1
Medium: Muscle 900 MHz Medium parameters used (interpolated): f = 824.2 MHz; $\sigma = 0.968$ mho/m; $\varepsilon_r = 54.4$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(5.84, 5.84, 5.84); Calibrated: 2010/5/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2010/8/18
- Phantom: SAM1; Type: SAM 4.0; Serial: TP:1419
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Bottom up/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.051 mW/g
Bottom up/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.21 V/m; Power Drift = -0.127 dB
Peak SAR (extrapolated) = 0.086 W/kg
SAR(1 g) = 0.048 mW/g; SAR(10 g) = 0.032 mW/g
Maximum value of SAR (measured) = 0.051 mW/g



0 dB = 0.051mW/g

Configuration 1_GPRS850_CH190

DUT: HSTNN-F05C;

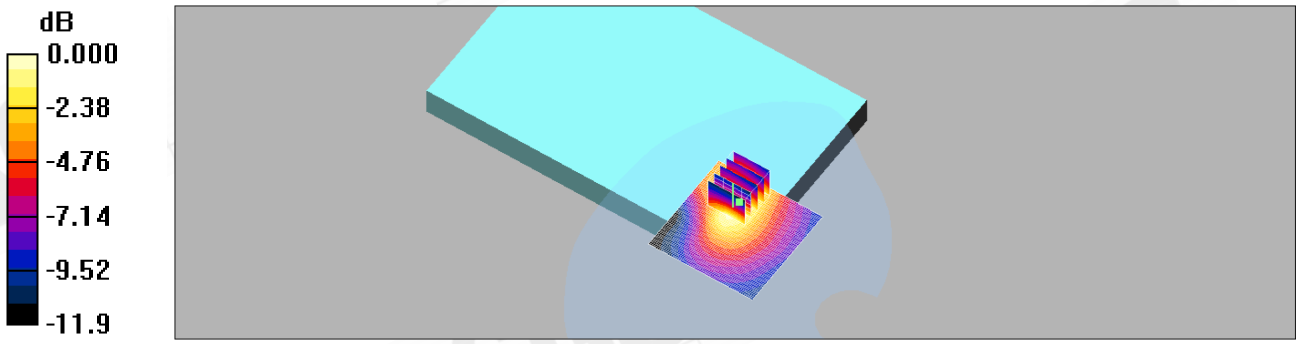
Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:4.1
Medium: Muscle 900 MHz Medium parameters used: f = 837 MHz; σ = 0.981 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(5.84, 5.84, 5.84); Calibrated: 2010/5/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2010/8/18
- Phantom: SAM1; Type: SAM 4.0; Serial: TP:1419
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Bottom up/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.064 mW/g

Bottom up/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.64 V/m; Power Drift = 0.157 dB
Peak SAR (extrapolated) = 0.110 W/kg
SAR(1 g) = 0.062 mW/g; SAR(10 g) = 0.041 mW/g
Maximum value of SAR (measured) = 0.068 mW/g



0 dB = 0.068mW/g

Configuration 1_GPRS850_CH251

DUT: HSTNN-F05C;

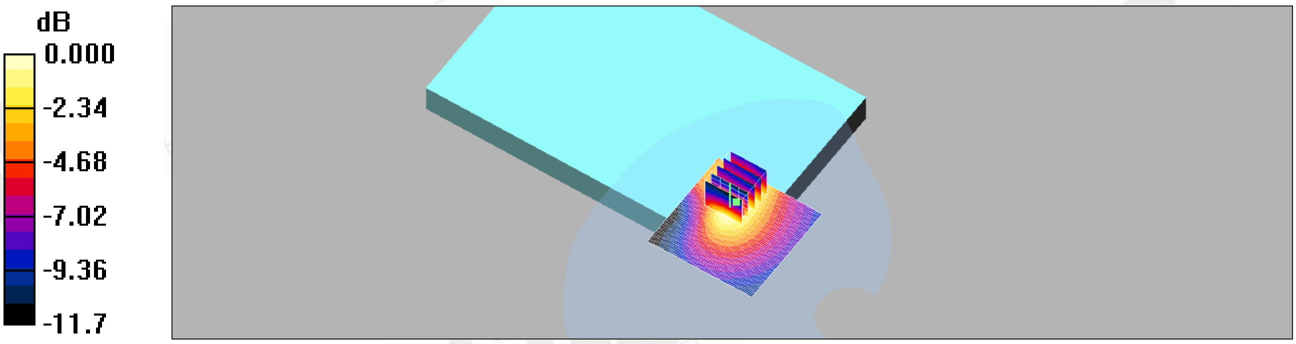
Communication System: GSM 850; Frequency: 848.8 MHz;Duty Cycle: 1:4.1
Medium: Muscle 900 MHz Medium parameters used: f = 849 MHz; σ = 0.994 mho/m; ε_r = 54.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

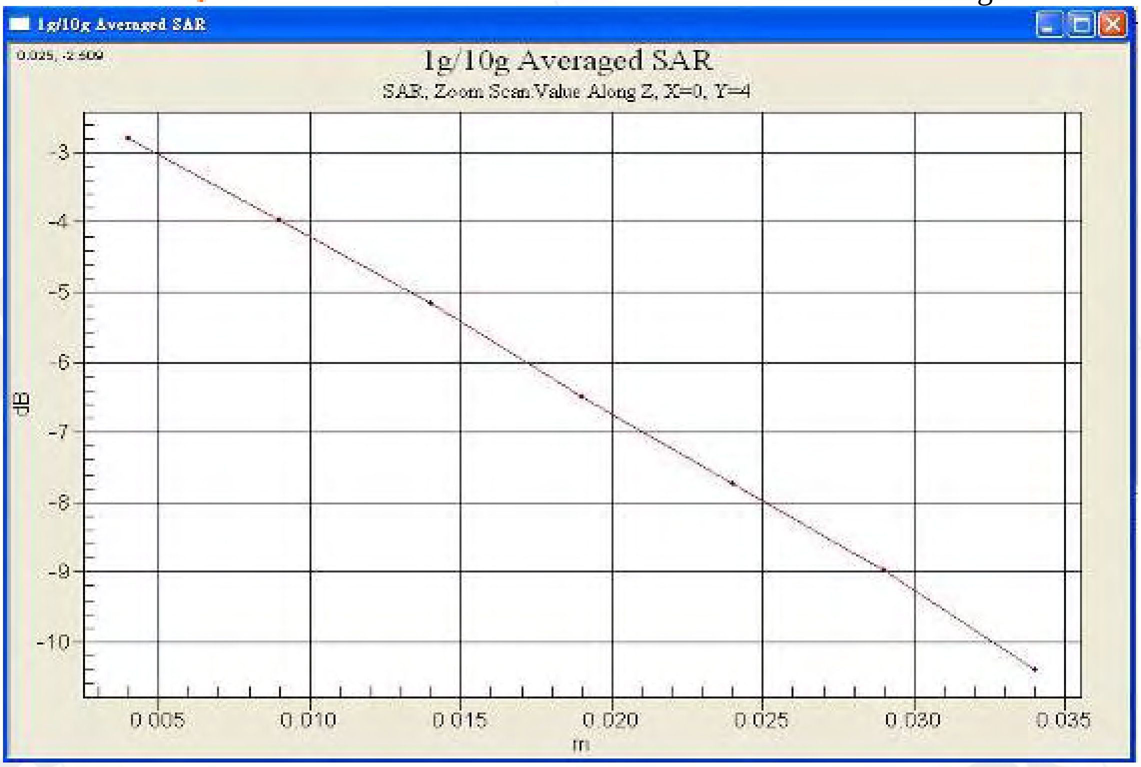
- Probe: ES3DV3 - SN3172; ConvF(5.84, 5.84, 5.84); Calibrated: 2010/5/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2010/8/18
- Phantom: SAM1; Type: SAM 4.0; Serial: TP:1419
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Bottom up/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.070 mW/g

Bottom up/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.80 V/m; Power Drift = 0.052 dB
Peak SAR (extrapolated) = 0.109 W/kg
SAR(1 g) = 0.063 mW/g; SAR(10 g) = 0.040 mW/g
Maximum value of SAR (measured) = 0.071 mW/g



0 dB = 0.071mW/g


1g/10g Averaged SAR
0.025, -2.509
1g/10g Averaged SAR
SAR; Zoom Scan Value Along Z, X=0, Y=4
dB
-3
-4
-5
-6
-7
-8
-9
-10
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

Configuration 1_GPRS1900_CH512

DUT: HSTNN-F05C;

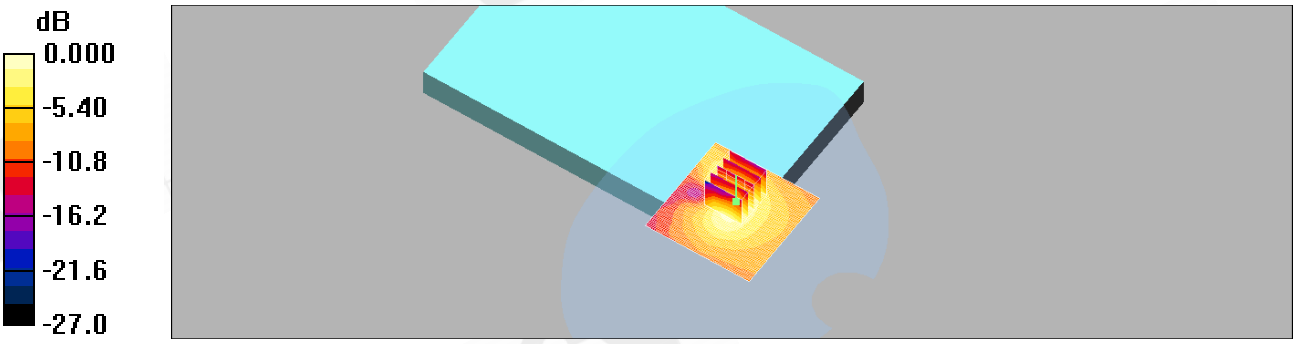
Communication System: GSM1900; Frequency: 1850.2 MHz;Duty Cycle: 1:4.1
Medium: M1800 & 1900 Medium parameters used (interpolated): f = 1850.2 MHz; σ = 1.55 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(4.45, 4.45, 4.45); Calibrated: 2010/5/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2010/8/18
- Phantom: SAM1; Type: SAM 4.0; Serial: TP:1419
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Bottom up/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.035 mW/g

Bottom up/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.21 V/m; Power Drift = 0.013 dB
Peak SAR (extrapolated) = 0.057 W/kg
SAR(1 g) = 0.034 mW/g; SAR(10 g) = 0.019 mW/g
Maximum value of SAR (measured) = 0.038 mW/g



0 dB = 0.038mW/g

Configuration 1_GPRS1900_CH661

DUT: HSTNN-F05C;

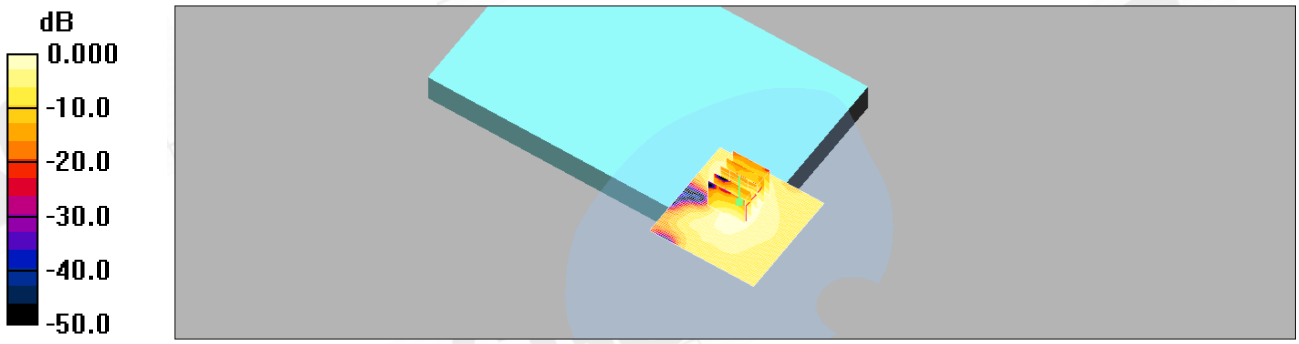
Communication System: GSM1900; Frequency: 1880 MHz;Duty Cycle: 1:4.1
Medium: M1800 & 1900 Medium parameters used: f = 1880 MHz; σ = 1.56 mho/m; ε_r = 53.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(4.45, 4.45, 4.45); Calibrated: 2010/5/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2010/8/18
- Phantom: SAM1; Type: SAM 4.0; Serial: TP:1419
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Bottom up/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.018 mW/g

Bottom up/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.29 V/m; Power Drift = 0.114 dB
Peak SAR (extrapolated) = 0.028 W/kg
SAR(1 g) = 0.017 mW/g; SAR(10 g) = 0.00932 mW/g
Maximum value of SAR (measured) = 0.019 mW/g



0 dB = 0.019mW/g

Configuration 1_GPRS1900_CH810

DUT: HSTNN-F05C;

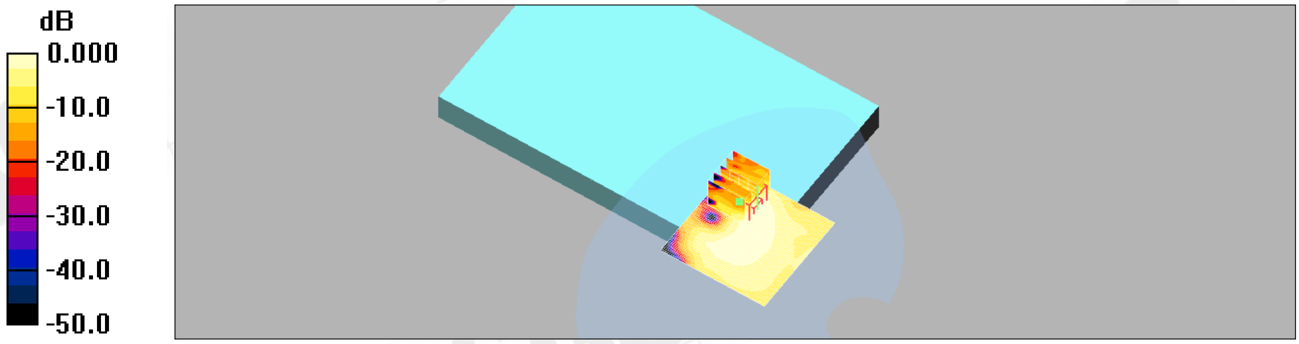
Communication System: GSM1900; Frequency: 1909.8 MHz;Duty Cycle: 1:4.1
Medium: M1800 & 1900 Medium parameters used: f = 1910 MHz; σ = 1.6 mho/m; ε_r = 53.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(4.45, 4.45, 4.45); Calibrated: 2010/5/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2010/8/18
- Phantom: SAM1; Type: SAM 4.0; Serial: TP:1419
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Bottom up/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.014 mW/g

Bottom up/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.16 V/m; Power Drift = 0.105 dB
Peak SAR (extrapolated) = 0.020 W/kg
SAR(1 g) = 0.00968 mW/g; SAR(10 g) = 0.00519 mW/g
Maximum value of SAR (measured) = 0.012 mW/g



0 dB = 0.012mW/g

Configuration 1_WCDMA B2_CH9262

DUT: HSTNN-F05C;

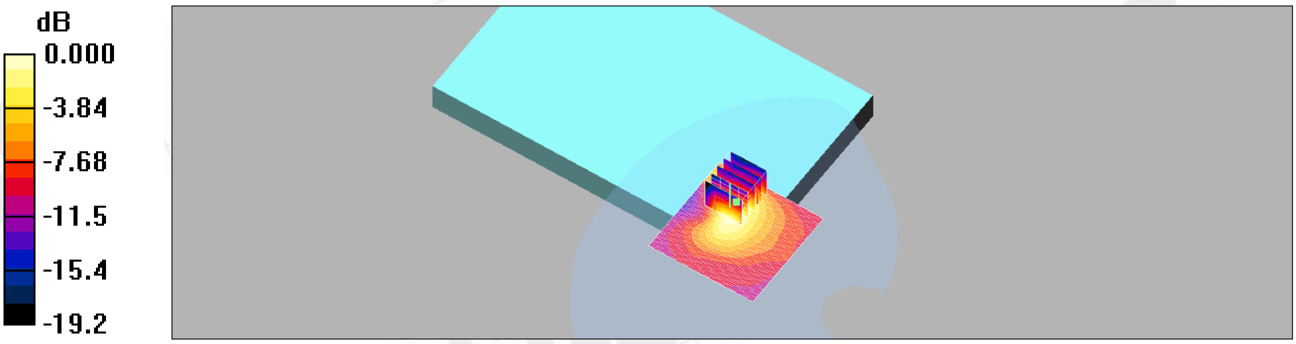
Communication System: WCDMA BAND2; Frequency: 1852.4 MHz;Duty Cycle: 1:1
Medium: M1800 & 1900 Medium parameters used (interpolated): f = 1852.4 MHz; σ = 1.55 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(4.45, 4.45, 4.45); Calibrated: 2010/5/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2010/8/18
- Phantom: SAM1; Type: SAM 4.0; Serial: TP:1419
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Bottom up/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.036 mW/g

Bottom up/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.24 V/m; Power Drift = 0.131 dB
Peak SAR (extrapolated) = 0.050 W/kg
SAR(1 g) = 0.031 mW/g; SAR(10 g) = 0.017 mW/g
Maximum value of SAR (measured) = 0.033 mW/g



0 dB = 0.033mW/g

Configuration 1_WCDMA B2_CH9400

DUT: HSTNN-F05C;

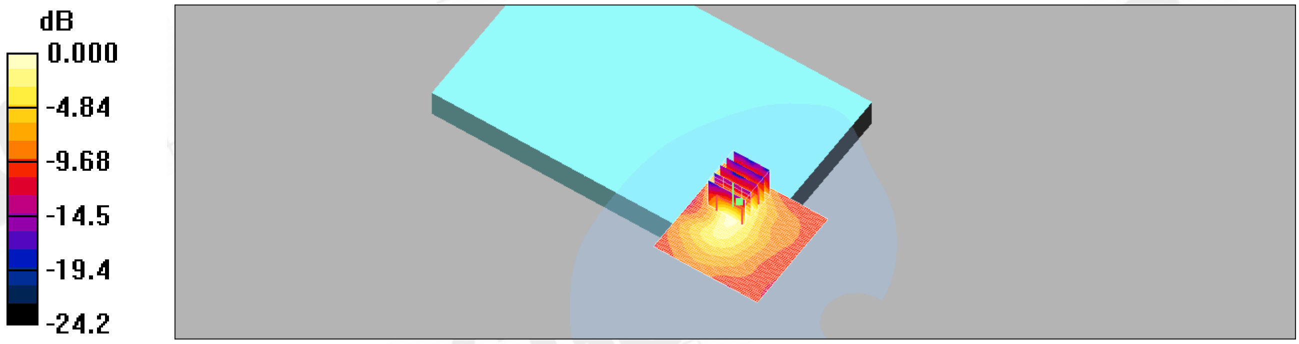
Communication System: WCDMA BAND2; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium: M1800 & 1900 Medium parameters used: f = 1880 MHz; σ = 1.56 mho/m; ε_r = 53.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(4.45, 4.45, 4.45); Calibrated: 2010/5/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2010/8/18
- Phantom: SAM1; Type: SAM 4.0; Serial: TP:1419
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Bottom up/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.038 mW/g

Bottom up/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.15 V/m; Power Drift = 0.102 dB
Peak SAR (extrapolated) = 0.056 W/kg
SAR(1 g) = 0.032 mW/g; SAR(10 g) = 0.017 mW/g
Maximum value of SAR (measured) = 0.036 mW/g



0 dB = 0.036mW/g

Configuration 1_WCDMA B2_CH9538

DUT: HSTNN-F05C;

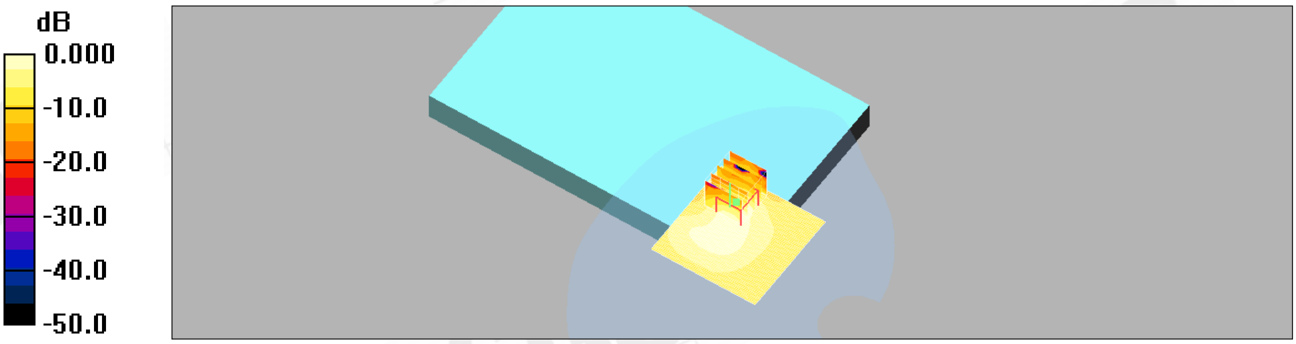
Communication System: WCDMA BAND2; Frequency: 1907.6 MHz;Duty Cycle: 1:1
Medium: M1800 & 1900 Medium parameters used: f = 1908 MHz; σ = 1.6 mho/m; ε_r = 53.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(4.45, 4.45, 4.45); Calibrated: 2010/5/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2010/8/18
- Phantom: SAM1; Type: SAM 4.0; Serial: TP:1419
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Bottom up/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.022 mW/g

Bottom up/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.20 V/m; Power Drift = 0.031 dB
Peak SAR (extrapolated) = 0.033 W/kg
SAR(1 g) = 0.019 mW/g; SAR(10 g) = 0.0099 mW/g
Maximum value of SAR (measured) = 0.020 mW/g



0 dB = 0.020mW/g

Date: 2010/10/4

Configuration 1_WCDMA B5_CH4132

DUT: HSTNN-F05C;

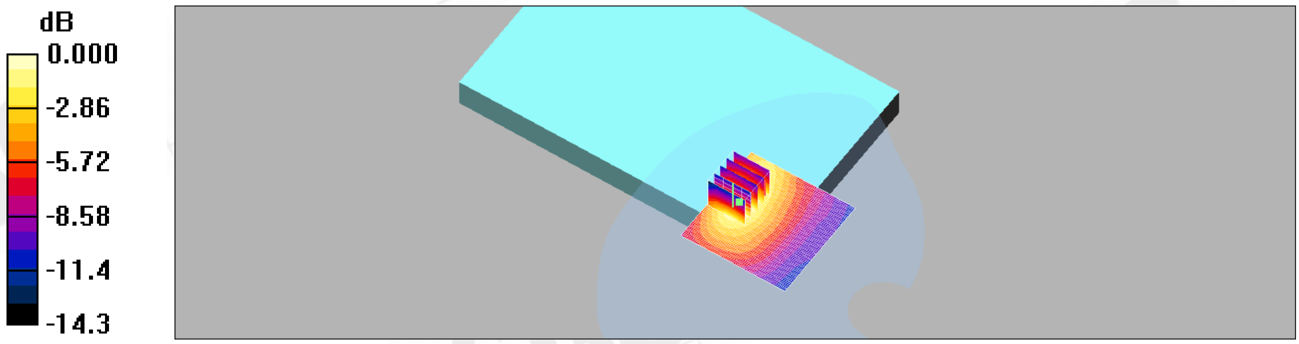
Communication System: WCDMA BAND5; Frequency: 826.4 MHz;Duty Cycle: 1:1
Medium: Muscle 900 MHz Medium parameters used (interpolated): f = 826.4 MHz; σ = 0.97 mho/m; ε_r = 54.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(5.84, 5.84, 5.84); Calibrated: 2010/5/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2010/8/18
- Phantom: SAM1; Type: SAM 4.0; Serial: TP:1419
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Bottom up/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.019 mW/g

Bottom up/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.29 V/m; Power Drift = 0.130 dB
Peak SAR (extrapolated) = 0.033 W/kg
SAR(1 g) = 0.019 mW/g; SAR(10 g) = 0.012 mW/g
Maximum value of SAR (measured) = 0.021 mW/g



0 dB = 0.021mW/g

Date: 2010/10/4

Configuration 1_WCDMA B5_CH4183

DUT: HSTNN-F05C;

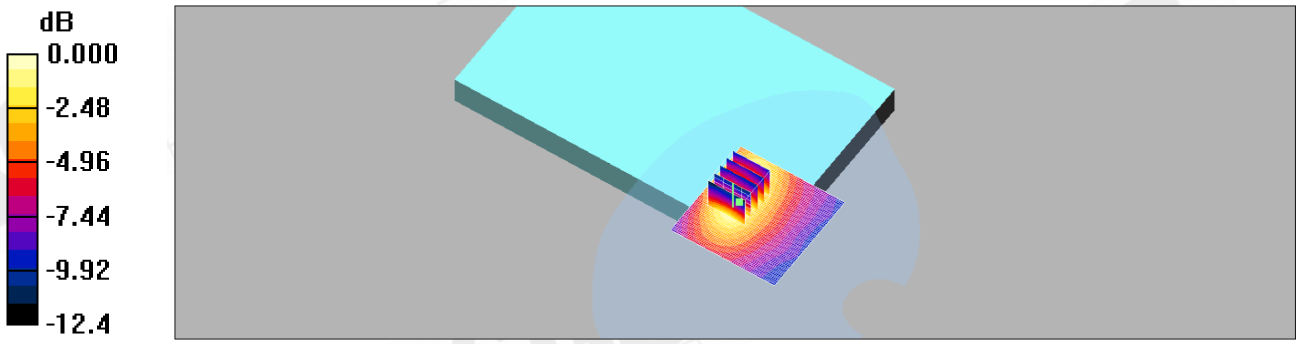
Communication System: WCDMA BAND5; Frequency: 836.6 MHz;Duty Cycle: 1:1
Medium: Muscle 900 MHz Medium parameters used: f = 837 MHz; σ = 0.981 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(5.84, 5.84, 5.84); Calibrated: 2010/5/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2010/8/18
- Phantom: SAM1; Type: SAM 4.0; Serial: TP:1419
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Bottom up/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.024 mW/g

Bottom up/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.70 V/m; Power Drift = -0.030 dB
Peak SAR (extrapolated) = 0.041 W/kg
SAR(1 g) = 0.024 mW/g; SAR(10 g) = 0.015 mW/g
Maximum value of SAR (measured) = 0.026 mW/g



0 dB = 0.026mW/g

Configuration 1_WCDMA B5_CH4233

DUT: HSTNN-F05C;

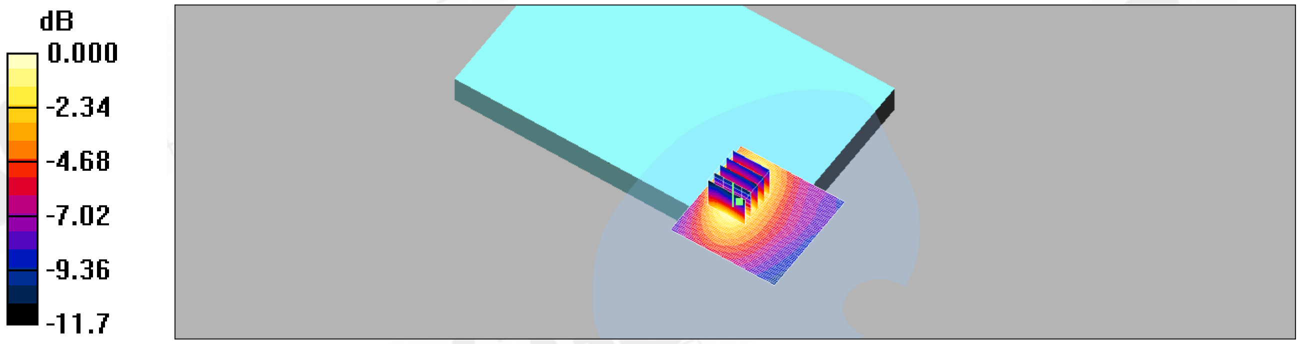
Communication System: WCDMA BAND5; Frequency: 846.6 MHz;Duty Cycle: 1:1
Medium: Muscle 900 MHz Medium parameters used: f = 847 MHz; σ = 0.992 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(5.84, 5.84, 5.84); Calibrated: 2010/5/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2010/8/18
- Phantom: SAM1; Type: SAM 4.0; Serial: TP:1419
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Bottom up/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.025 mW/g

Bottom up/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.73 V/m; Power Drift = 0.137 dB
Peak SAR (extrapolated) = 0.040 W/kg
SAR(1 g) = 0.023 mW/g; SAR(10 g) = 0.015 mW/g
Maximum value of SAR (measured) = 0.026 mW/g



0 dB = 0.026mW/g

5. SAR System Performance Verification

Date: 2010/10/4

DUT: Dipole 835 MHz;

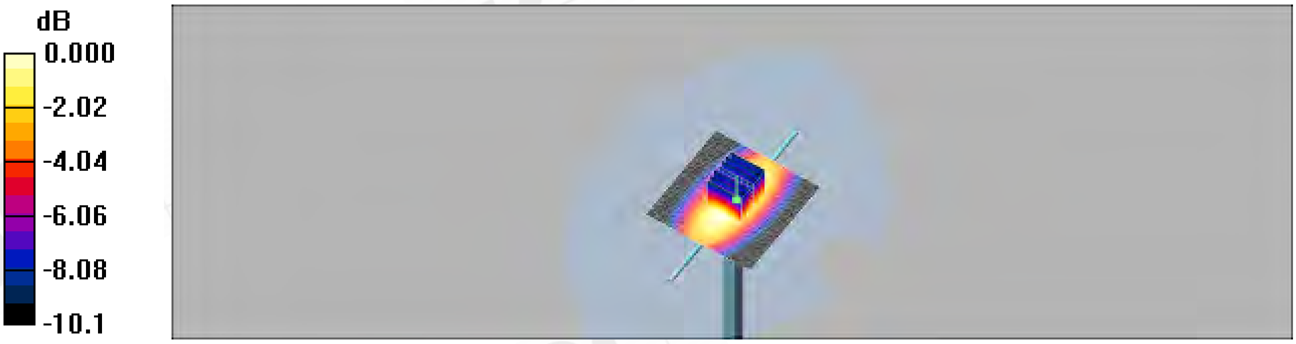
Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: Muscle 900 MHz Medium parameters used: f = 835 MHz; σ = 0.978 mho/m; ε_r = 54.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(5.84, 5.84, 5.84); Calibrated: 2010/5/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2010/8/18
- Phantom: SAM1; Type: SAM 4.0; Serial: TP:1419
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Pin=250mW/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.84 mW/g

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.8 V/m; Power Drift = -0.057 dB
Peak SAR (extrapolated) = 3.84 W/kg
SAR(1 g) = 2.62 mW/g; SAR(10 g) = 1.73 mW/g
Maximum value of SAR (measured) = 2.82 mW/g



0 dB = 2.82mW/g

DUT: Dipole 1900 MHz;

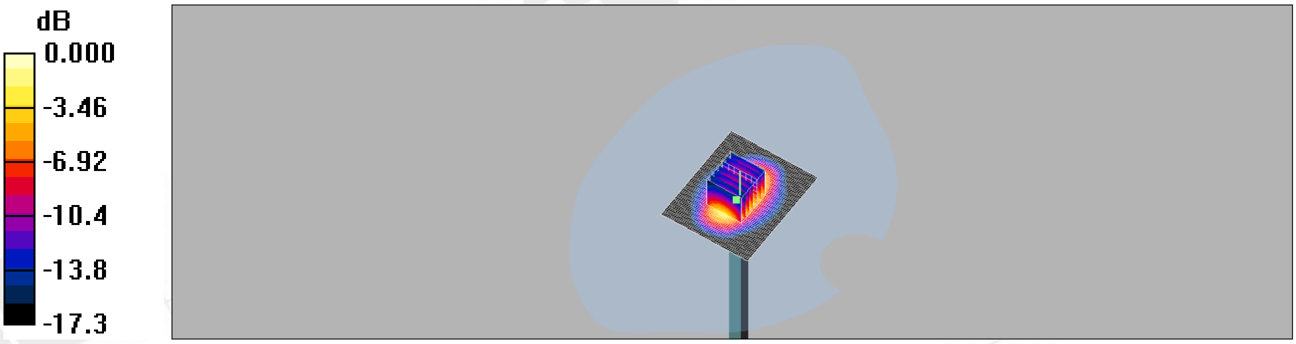
Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: M1800 & 1900 Medium parameters used: f = 1900 MHz; σ = 1.58 mho/m; ε_r = 53.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(4.45, 4.45, 4.45); Calibrated: 2010/5/21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2010/8/18
- Phantom: SAM1; Type: SAM 4.0; Serial: TP:1419
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Pin=250mW/Area Scan (51x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 14.0 mW/g

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 86.5 V/m; Power Drift = -0.140 dB
Peak SAR (extrapolated) = 17.7 W/kg
SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.46 mW/g
Maximum value of SAR (measured) = 11.6 mW/g



0 dB = 11.6mW/g

SGS Taiwan Ltd. No.134, Wu Kung Road, Wuku Industrial Zone, Taipei County, Taiwan / 台北縣五股工業區五工路 134 號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

6. DAE & Probe Calibration certificate

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

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

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

Accreditation No.: **SCS 108**

Client **SGS-TW**

Certificate No: **DAE4-547_Aug10**

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BJ - SN: 547
Calibration procedure(s)	QA CAL-06.v22 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	August 18, 2010

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	1-Oct-09 (No: 9055)	Oct-10
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

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

Issued: August 18, 2010

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

Certificate No: DAE4-547_Aug10 Page 1 of 5

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

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

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

Accreditation No.: **SCS 108**

Client **SGS-TW (Auden)**

Certificate No: **ES3-3172_May10**

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3172
Calibration procedure(s)	QA CAL-01.v6, QA CAL-14.v3, QA CAL-23.v3 and QA CAL-25.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	May 21, 2010

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	1-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe ES3DV2	SN: 3013	30-Dec-09 (No. ES3-3013_Dec09)	Dec-10
DAE4	SN: 660	20-Apr-10 (No. DAE4-660_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-09)	In house check: Oct10

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

Issued: May 22, 2010

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

SGS Taiwan Ltd. No.134, Wu Kung Road, Wuku Industrial Zone, Taipei County, Taiwan / 台北縣五股工業區五工路 134 號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

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

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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

SGS Taiwan Ltd. No.134, Wu Kung Road, Wuku Industrial Zone, Taipei County, Taiwan / 台北縣五股工業區五工路 134 號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

Probe ES3DV3

SN:3172

Manufactured:	January 23, 2008
Last calibrated:	May 27, 2009
Recalibrated:	May 21, 2010

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

SGS Taiwan Ltd. No.134, Wu Kung Road, Wuku Industrial Zone, Taipei County, Taiwan / 台北縣五股工業區五工路 134 號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

ES3DV3 SN:3172 May 21, 2010

DASY/EASY - Parameters of Probe: ES3DV3 SN:3172

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.37	1.19	0.97	± 10.1%
DCP (mV)[B]	93.9	92.5	93.2	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	300.0	± 1.5%
			Y	0.00	0.00	1.00	300.0	
			Z	0.00	0.00	1.00	300.0	

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

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

SGS Taiwan Ltd. No.134, Wu Kung Road, Wuku Industrial Zone, Taipei County, Taiwan / 台北縣五股工業區五工路 134 號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

ES3DV3 SN:3172 May 21, 2010

DASY/EASY - Parameters of Probe: ES3DV3 SN:3172

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
835	± 50 / ± 100	41.5 ± 5%	0.90 ± 5%	5.85	5.85	5.85	0.76	1.14 ± 11.0%
900	± 50 / ± 100	41.5 ± 5%	0.97 ± 5%	5.75	5.75	5.75	0.87	1.08 ± 11.0%
1750	± 50 / ± 100	40.1 ± 5%	1.37 ± 5%	5.04	5.04	5.04	0.31	1.82 ± 11.0%
1900	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	4.89	4.89	4.89	0.50	1.46 ± 11.0%
2000	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	4.73	4.73	4.73	0.49	1.44 ± 11.0%
2450	± 50 / ± 100	39.2 ± 5%	1.80 ± 5%	4.32	4.32	4.32	0.42	1.70 ± 11.0%

[C] The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

DASY/EASY - Parameters of Probe: ES3DV3 SN:3172

Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
835	± 50 / ± 100	55.2 ± 5%	0.97 ± 5%	5.84	5.84	5.84	0.81	1.19 ± 11.0%
900	± 50 / ± 100	55.0 ± 5%	1.05 ± 5%	5.75	5.75	5.75	0.73	1.24 ± 11.0%
1750	± 50 / ± 100	53.4 ± 5%	1.49 ± 5%	4.63	4.63	4.63	0.39	1.75 ± 11.0%
1900	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	4.45	4.45	4.45	0.32	2.36 ± 11.0%
2000	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	4.47	4.47	4.47	0.32	2.44 ± 11.0%
2450	± 50 / ± 100	52.7 ± 5%	1.95 ± 5%	4.11	4.11	4.11	0.82	1.17 ± 11.0%
2600	± 50 / ± 100	52.5 ± 5%	2.16 ± 5%	3.99	3.99	3.99	0.95	1.09 ± 11.0%
3500	± 50 / ± 100	51.3 ± 5%	3.31 ± 5%	3.28	3.28	3.28	1.00	1.28 ± 13.1%

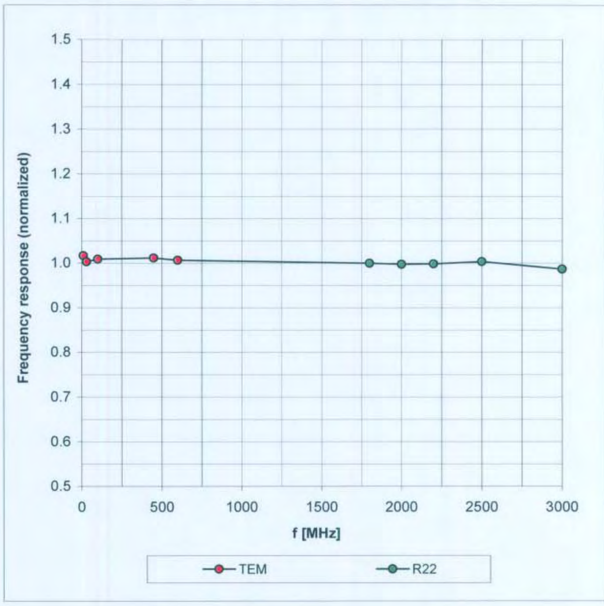
[C] The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

SGS Taiwan Ltd. No.134, Wu Kung Road, Wuku Industrial Zone, Taipei County, Taiwan / 台北縣五股工業區五工路 134 號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

ES3DV3 SN:3172 May 21, 2010

Frequency Response of E-Field

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

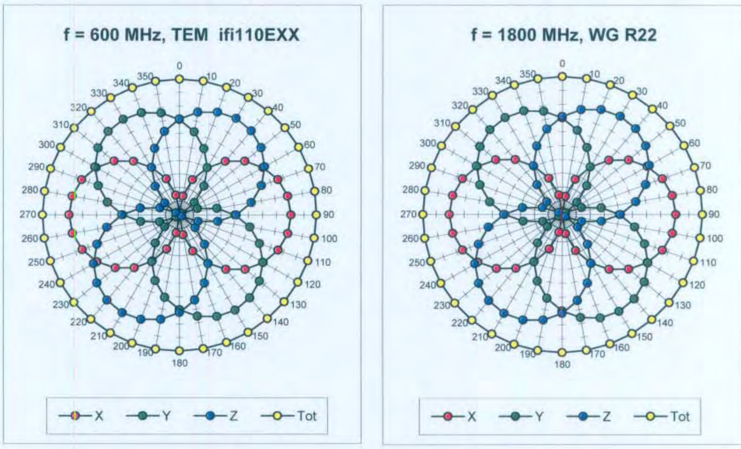


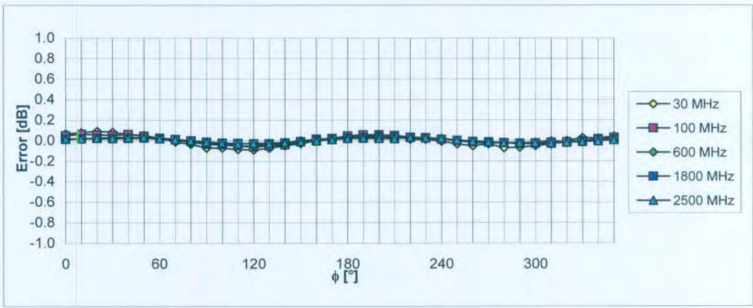
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

SGS Taiwan Ltd. No.134, Wu Kung Road, Wuku Industrial Zone, Taipei County, Taiwan / 台北縣五股工業區五工路 134 號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

ES3DV3 SN:3172 May 21, 2010

Receiving Pattern (ϕ), $\vartheta = 0°$



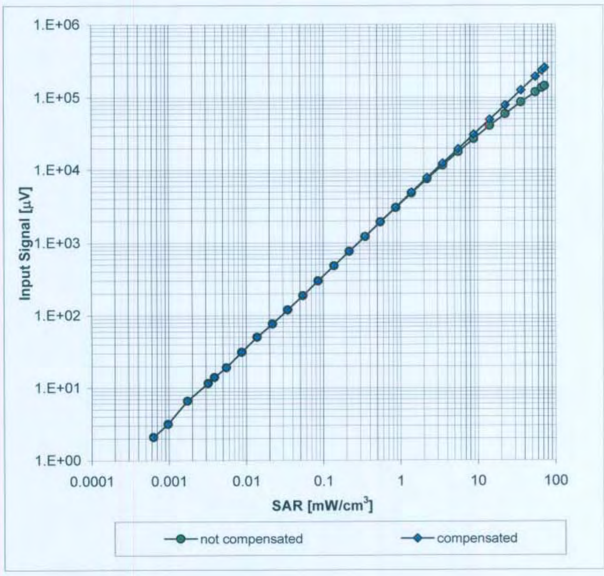


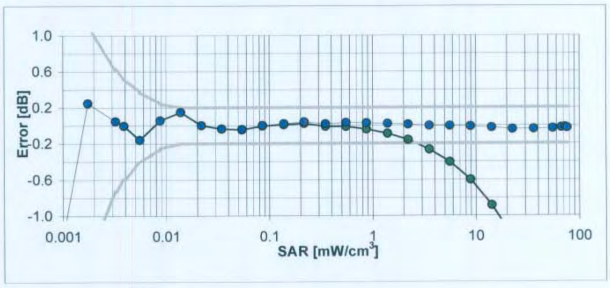
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

ES3DV3 SN:3172 May 21, 2010

Dynamic Range f(SAR_{head})

(Waveguide R22, f = 1800 MHz)

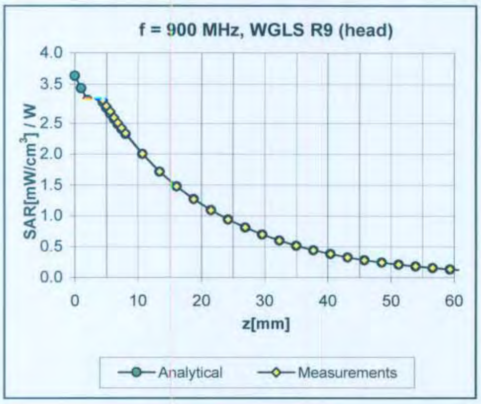


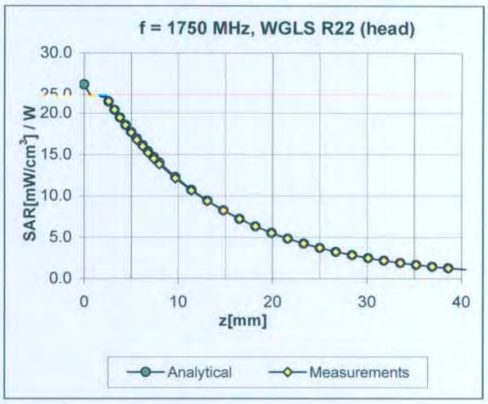


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

ES3DV3 SN:3172 May 21, 2010

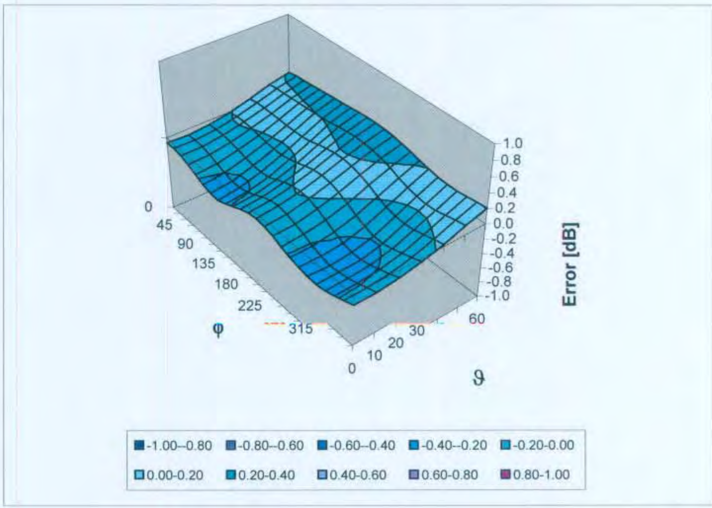
Conversion Factor Assessment





Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

Certificate No: ES3-3172_May10 Page 10 of 11

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4.0 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

SGS Taiwan Ltd. No.134, Wu Kung Road, Wuku Industrial Zone, Taipei County, Taiwan / 台北縣五股工業區五工路 134 號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

7. Uncertainty Analysis

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
Measurement system								
Probe calibration	5.9%	N	1	1	1	5.9%	5.9%	∞
Isotropy , Axial	4.7%	R	$\sqrt{3}$	1	1	2.7%	2.7%	∞
Isotropy, Hemispherical	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%	∞
Measurement drift (class A evaluation)	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 shell	2.9%	R	√3	1	1	1.7%	1.7%	∞
Post-processing	1.0%	R	√3	1	1	0.6%	0.6%	∞
Max SAR Eval	1.0%	R	√3	1	1	0.6%	0.6%	∞
Test Sample related								
Test sample positioning	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	√3	1	1	2.9%	2.9%	∞
Phantom and Setup								
Phantom Uncertainty	4.0%	R	√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 permitivity(meas.) Max at 835 band	2.2%	N	1	0.6	0.49	1.3%	1.1%	M
Combined standard uncertainty		RSS				11.8%	11.6%	
Expant uncertainty (95% confidence interval), K=2						23.6%	23.2%	

SGS Taiwan Ltd.No.134, Wu Kung Road, Wuku Industrial Zone, Taipei County, Taiwan / 台北縣五股工業區五工路 134 號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com

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)

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
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_May10**

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d063
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	May 21, 2010

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-09 (No. 217-01086)	Oct-10
Power sensor HP 8481A	US37292783	06-Oct-09 (No. 217-01086)	Oct-10
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	02-Mar-10 (No. DAE4-601_Mar10)	Mar-11

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

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

Issued: May 26, 2010

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

Certificate No: D835V2-4d063_May10 Page 1 of 9

DASY5 Validation Report for Body

Date/Time: 20.05.2010 10:45:06

Test Laboratory: SPEAG, Zurich, Switzerland

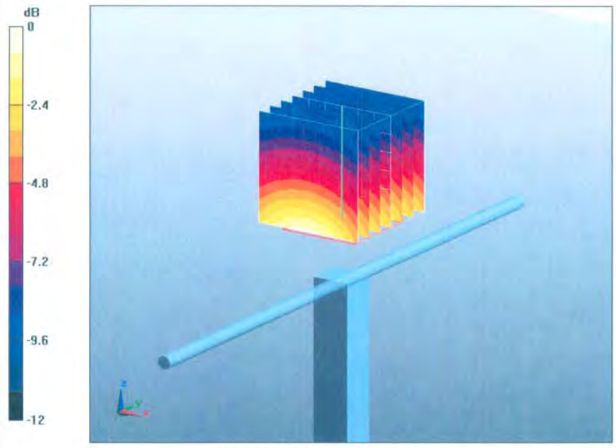
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d063

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: MSL900
Medium parameters used: f = 835 MHz; σ = 0.98 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.86, 5.86, 5.86); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.03.2010
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

Pin250 mW/d=15mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.5 V/m; Power Drift = 0.013 dB
Peak SAR (extrapolated) = 3.71 W/kg
SAR(1 g) = 2.53 mW/g; SAR(10 g) = 1.66 mW/g
Maximum value of SAR (measured) = 2.94 mW/g



0 dB = 2.94mW/g

Certificate No: D835V2-4d063_May10 Page 8 of 9

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: **D1900V2-5d027_Apr10**

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d027
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	April 28, 2010

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-09 (No. 217-01086)	Oct-10
Power sensor HP 8481A	US37292783	06-Oct-09 (No. 217-01086)	Oct-10
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	26-Jun-09 (No. ES3-3205_Jun09)	Jun-10
DAE4	SN: 601	02-Mar-10 (No. DAE4-601_Mar10)	Mar-11

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

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

Issued: April 29, 2010

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

SGS Taiwan Ltd. No.134, Wu Kung Road, Wuku Industrial Zone, Taipei County, Taiwan / 台北縣五股工業區五工路 134 號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group

DASY5 Validation Report for Body

Date/Time: 28.04.2010 15:11:22

Test Laboratory: SPEAG, Zurich, Switzerland

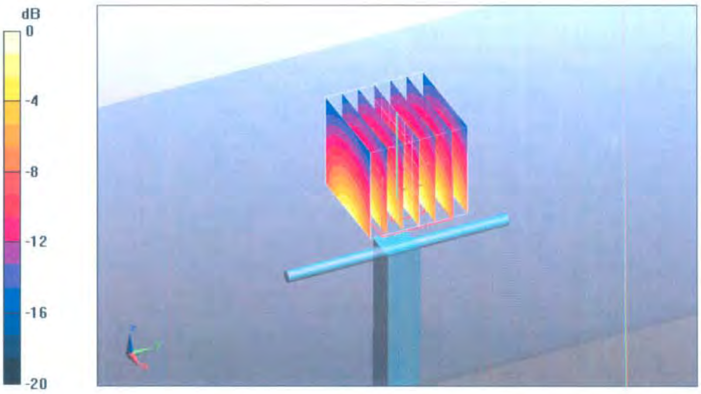
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d027

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: MSL U11 BB
Medium parameters used: f = 1900 MHz; σ = 1.53 mho/m; ε_r = 54.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.59, 4.59, 4.59); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.03.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 57

Pin250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.2 V/m; Power Drift = -0.014 dB
Peak SAR (extrapolated) = 17.1 W/kg
SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.36 mW/g
Maximum value of SAR (measured) = 12.7 mW/g



0 dB = 12.7mW/g

Certificate No: D1900V2-5d027_Apr10 Page 8 of 9

End of 1st part of report

SGS Taiwan Ltd. No.134, Wu Kung Road, Wuku Industrial Zone, Taipei County, Taiwan / 台北縣五股工業區五工路 134 號
台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488 www.tw.sgs.com
Member of SGS Group