SAR TEST REPORT

The following samples were submitted and identified on behalf of the client as:

Equipment Under Test	ZIGBEE USB DONGLE
Model Name	SDJ-731
Brand Name	SPECTEC
Company Name	SPECTEC COMPUTER CO., LTD.
Company Address	6F. No.92. Nanking E. Rd. Sec. 5, Taipei, Taiwan.
Standards	FCC OET 65 supplement C,IEEE /ANSI C95.1 , C95.3, IEEE 1528,RSS-102,EN62209-2:2010
FCC ID	S2Y-SDJ731ZD
IC ID	8543A-SDJ731ZD
Date of Receipt	Nov. 23, 2011
Date of Test(s)	Feb. 06, 2012
Date of Issue	Mar. 14, 2012

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.

Signed for on the behalf of SGS

Supervisor	**Supervisor**
Ricky Huang	Nick Hsu
Ricky Huang	**Nick Hsu**
Date: Mar. 14, 2012	**Date:** Mar. 14, 2012

Version

Report Number	Revision	Date	Memo
ES/2011/B0009	00	2012/02/16	Initial creation of test report.
ES/2011/B0009	01	2012/03/14	1st modification

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

SGS Taiwan Ltd. 台灣檢驗科技股份有限公司 | No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei County, Taiwan. / 台北縣五股工業區五工路136之1號
t (886-2) 2299-3939 f (886-2) 2299-9489 www.sgs.com.tw

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

Company Name	SPECTEC COMPUTER CO., LTD.
Company Address	6F. No.92. Nanking E. Rd. Sec. 5, Taipei, Taiwan.
Contact Person	Ann Hsieh
TEL	+886-2-2753-2953
Fax	+886-2-2753-2949
E-mail	ann@spectec.com.tw

1.3 Description of EUT

EUT Name	ZIGBEE USB DONGLE		
Model Name	SDJ-731		
Brand Name	SPECTEC		
IC ID	8543A-SDJ731ZD		
FCC ID	S2Y-SDJ731ZD		
Duty Cycle	1		
TX Frequency Range (MHz)	2405	—	2480
Channel Number (ARFCN)	11	—	26
VOIP Function	☐YES ☒NO		
Max. SAR Measured(1 g) (Unit: mW/g)	Body worn	0.908	☒ Horizontal-Up ☐ Horizontal-Down ☐ Vertical-Front ☐ Vertical-Back ☐ Tip 2440 Channel

#. Conducted power table:

		Peak power
Frequency	2405	20.82
	2440	20.85
	2480	2.43

1.4 Test Environment

Ambient Temperature: 22±2° C

Tissue Simulating Liquid: 22±2° C

SGS Taiwan Ltd. 台灣檢驗科技股份有限公司 | No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei County, Taiwan. / 台北縣五股工業區五工路136之1號
t (886-2) 2299-3939 f (886-2) 2299-9489 www.sgs.com.tw

1.5 Operation description

Use chipset specific software to control the EUT, and makes it transmit in maximum power. 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.

We will test it with 5 configurations:

(Test distance is 5 mm)

Configuration 1: Horizontal-Up.
Configuration 2: Horizontal-Down.
Configuration 3: Vertical-Front
Configuration 4: Vertical-Back
Configuration 5: Tip side

1.6 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 EX3DV4 field probe is used to determine the internal electric fields. The SAR can be obtained from the equation SAR= σ ($|Ei|^2$)/ ρ where σ and ρ are the conductivity and mass density of the tissue-simulant.

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

- A standard high precision 6-axis robot (Staubli RX family) with controller, teach pendant and software. An arm extension is for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage intissue 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.

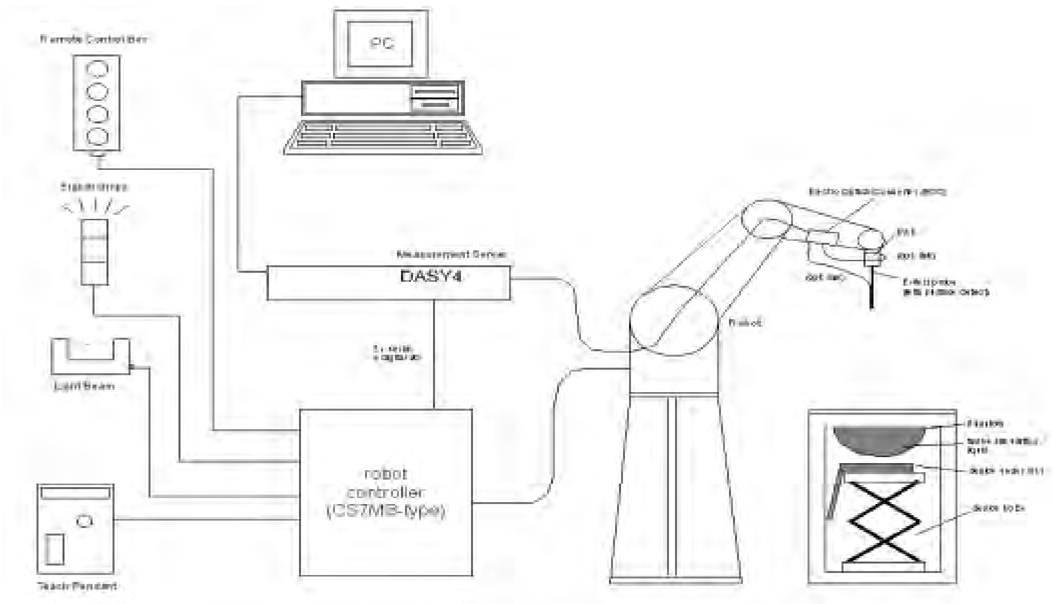


Fig.a The block diagram of SAR system

- 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.

1.7 System Components

EX3DV4 E-Field Probe

Construction	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Calibration	Basic Broad Band Calibration in air Conversion Factors (CF) for HSL 2450 MHz Additional CF for other liquids and frequencies upon request	
Frequency	10 MHz to > 4 GHz, Linearity: ± 0.2 dB (30 MHz to 6 GHz)	
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)	

Dynamic Range	10 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

1.8 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 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 (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 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.

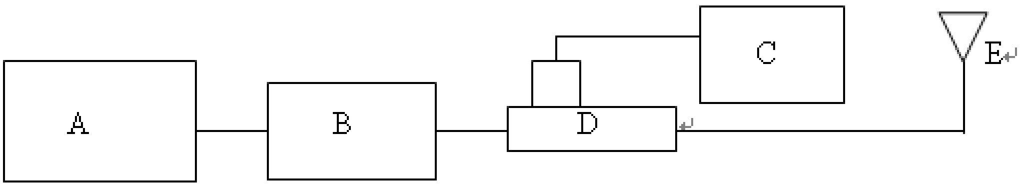
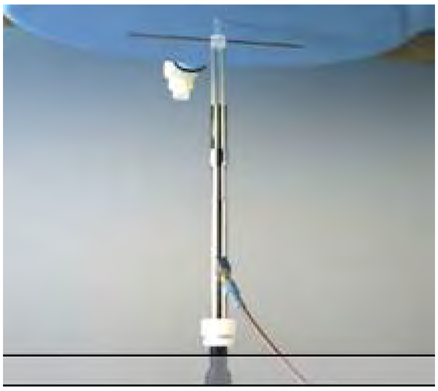


Fig.b The block diagram of system verification

A. Agilent Model 8648D Signal Generator
B. Mini circuits Model ZHL-42 Amplifier
C. Agilent Model U2001B USB Power sensor(Meter)
D. Agilent Model 777D Dual directional coupling
E. Reference dipole antenna



Photograph of the dipole Antenna

Validation Kit	S/N	Frequency (MHz)		Target SAR (1g) (Pin=250mW) (mW/g)	Measured SAR (1g)(mW/g)	Measured Date
D2450V2	727	2450	Body	12.7	12.6	Feb. 06, 2012

Table 2. Results of system validation

1.9 Tissue Simulant Fluid for the Frequency Band

The dielectric properties for this body-simulant fluid were measured by using the Agilent Model 85070D Dielectric Probe (rates frequency band 200 MHz to 20 GHz) in conjunction with HP 8753D Network Analyzer (30 KHz-6000 MHz).

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. (Fig .2)

Frequency (MHz)	Tissue type	Dielectric Parameters		Recommended Limits	Measured	Measurement date
2450	Body	ρ	Verification	48.07-53.13	51.3	Feb. 06, 2012
			Test CH (L)		51.5	
			Test CH (M)		51.3	
			Test CH (H)		51.1	
		σ (S/m)	Verification	1.81-2.01	1.92	
			Test CH (L)		1.87	
			Test CH (M)		1.9	
			Test CH (H)		2	
		Simulated Tissue Temp.(℃)		20-24	21.7	

Table 3. Dielectric Parameters of Tissue Simulant Fluid

The composition of the brain tissue simulating liquid:

Frequency (MHz)	Mode	Ingredient						Total amount
		DGMBE	Water	Salt	Preventol D-7	Cellulose	Sugar	
2450M	Body	313.65	686.35	—	—	—	—	1.0L(Kg)

Table 3. Recipes for tissue simulating liquid

1.10 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.

SGS Taiwan Ltd. 台灣檢驗科技股份有限公司 | No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei County, Taiwan. / 台北縣五股工業區五工路136之1號
t (886-2) 2299-3939 f (886-2) 2299-9489 www.sgs.com.tw

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.

SGS Taiwan Ltd. No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei County, Taiwan. / 台北縣五股工業區五工路136之1號
台灣檢驗科技股份有限公司 t (886-2) 2299-3939 f (886-2) 2299-9489 www.sgs.com.tw

1.11 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).

(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.

2. Summary of Results

2450 MHz

Frequency	EUT Position	Test Configuration	Averaged SAR over 1g (W/kg)			SAR Limit 1g (W/kg)
			2405 MHz	2440 MHz	2480 MHz	
2450 MHz	Body Worn	Horizontal-Up	0.766	0.908	0.00942	1.6
		Horizontal-Down	—	0.513	—	1.6
		Vertical-Front	—	0.504	—	1.6
		Vertical-Back	—	0.381	—	1.6
		Tip side	—	0.046	—	1.6

Test distance is 5mm.

\# According to KDB447498 the 1-g SAR for the highest output channel is less than 0.8 W/kg, where the transmission band corresponding to all channels is ≤ 100 MHz, testing for the other channels is not required.

SGS Taiwan Ltd. 台灣檢驗科技股份有限公司 | No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei County, Taiwan. / 台北縣五股工業區五工路136之1號
t (886-2) 2299-3939 f (886-2) 2299-9489 www.sgs.com.tw

3. Instruments List

Manufacturer	Device	Type	Serial number	Date of last calibration	Date of next calibration
Schmid & Partner Engineering AG	Dosimetric E-Field Probe	EX3DV4	3770	Apr.19.2011	Apr.18.2012
Schmid & Partner Engineering AG	2450 MHz System Validation Dipole	D2450V2	727	Apr.19.2011	Apr.18.2012
Schmid & Partner Engineering AG	Data acquisition Electronics	DAE4	547	Aug.29.2011	Aug.28.2012
Schmid & Partner Engineering AG	Software	DASY 4 V4.7	N/A	Calibration not required	Calibration not required
Schmid & Partner Engineering AG	Phantom	SAM	N/A	Calibration not required	Calibration not required
HP	Network Analyzer	8753D	3410A05547	Mar.16.2011	Mar.15.2012
Agilent	Dielectric Probe Kit	85070D	US01440168	Calibration not required	Calibration not required
Agilent	Dual-directional coupler	777D	50114	Aug.18.2011	Aug.17.2012
Agilent	RF Signal Generator	8648D	3847M00432	Jun.01.2011	May. 30.2012
Agilent	Power Sensor	U2001B	MY48100169	Apr.30.2011	Apr. 29.2012

4. Measurements

Date: 2012/2/6

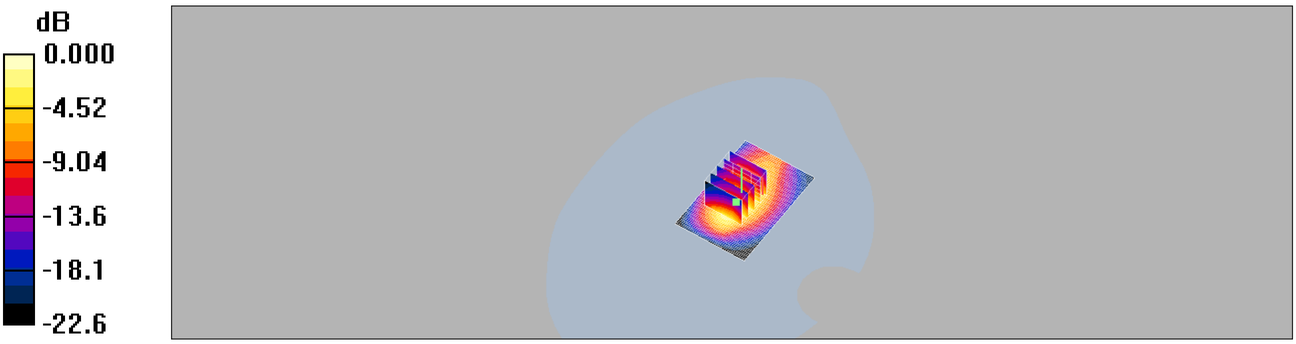
Horizontal up_ Low CH

Communication System: Zigbee; Frequency: 2405 MHz;Duty Cycle: 1:1
Medium: Muscle 2450 Medium parameters used: f = 2405 MHz; σ = 1.87 mho/m; ε_r = 51.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(6.96, 6.96, 6.96); Calibrated: 2011/4/19
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2011/8/29
- Phantom: SAM1; Type: SAM 4.0; Serial: TP:1419
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

BODY/Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.16 mW/g
BODY/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.04 V/m; Power Drift = -0.011 dB
Peak SAR (extrapolated) = 1.40 W/kg
SAR(1 g) = 0.766 mW/g; SAR(10 g) = 0.398 mW/g
Maximum value of SAR (measured) = 1.06 mW/g



0 dB = 1.06mW/g

Date: 2012/2/6

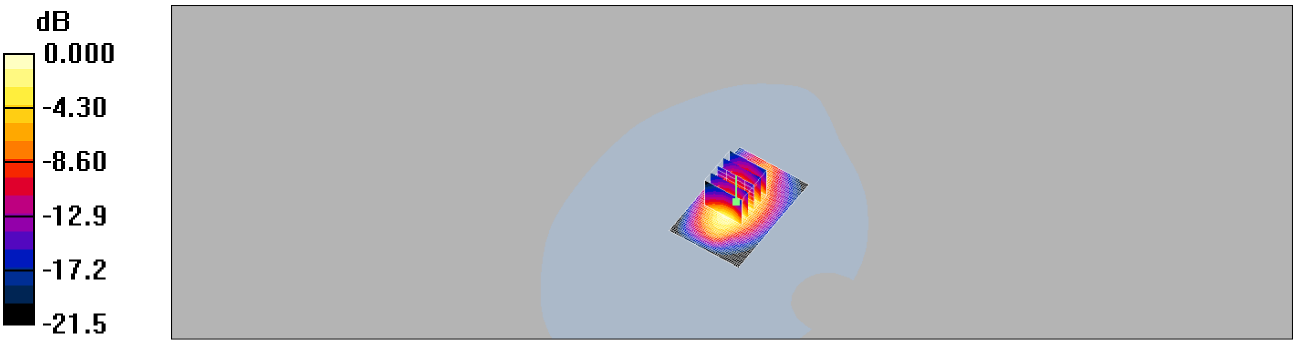
Horizontal up_ Mid CH

Communication System: Zigbee; Frequency: 2440 MHz;Duty Cycle: 1:1
Medium: Muscle 2450 Medium parameters used: f = 2440 MHz; σ = 1.9 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(6.96, 6.96, 6.96); Calibrated: 2011/4/19
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2011/8/29
- Phantom: SAM1; Type: SAM 4.0; Serial: TP:1419
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

BODY/Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.36 mW/g
BODY/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.60 V/m; Power Drift = 0.120 dB
Peak SAR (extrapolated) = 1.67 W/kg
SAR(1 g) = 0.908 mW/g; SAR(10 g) = 0.469 mW/g
Maximum value of SAR (measured) = 1.28 mW/g



0 dB = 1.28mW/g


0.017, -6.452
1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=0, Y=4
dB
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
-17
-18
-19
0.005
0.010
0.015
0.020
0.025
0.030
m

Date: 2012/2/6

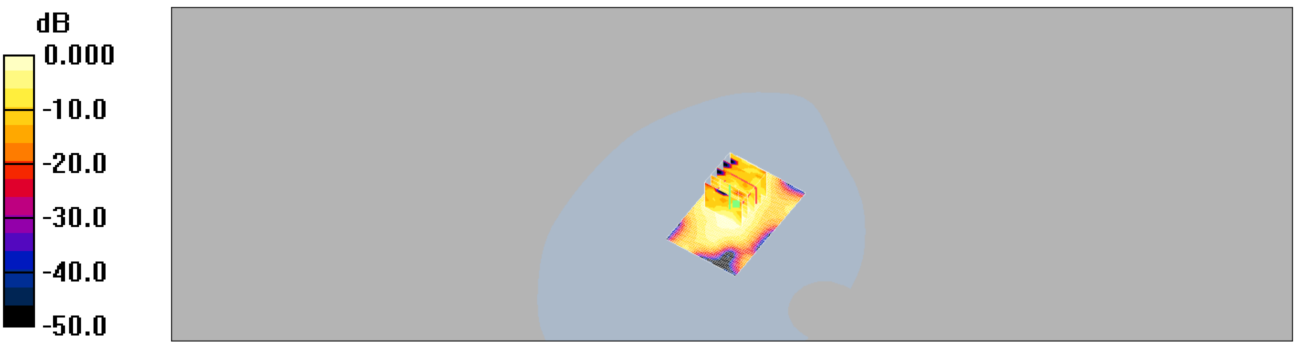
Horizontal up_ High CH

Communication System: Zigbee; Frequency: 2480 MHz;Duty Cycle: 1:1
Medium: Muscle 2450 Medium parameters used: f = 2480 MHz; σ = 2 mho/m; ε_r = 51.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(6.96, 6.96, 6.96); Calibrated: 2011/4/19
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2011/8/29
- Phantom: SAM1; Type: SAM 4.0; Serial: TP:1419
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

BODY/Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.015 mW/g
BODY/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.908 V/m; Power Drift = -0.176 dB
Peak SAR (extrapolated) = 0.018 W/kg
SAR(1 g) = 0.00942 mW/g; SAR(10 g) = 0.00486 mW/g
Maximum value of SAR (measured) = 0.013 mW/g



0 dB = 0.013mW/g

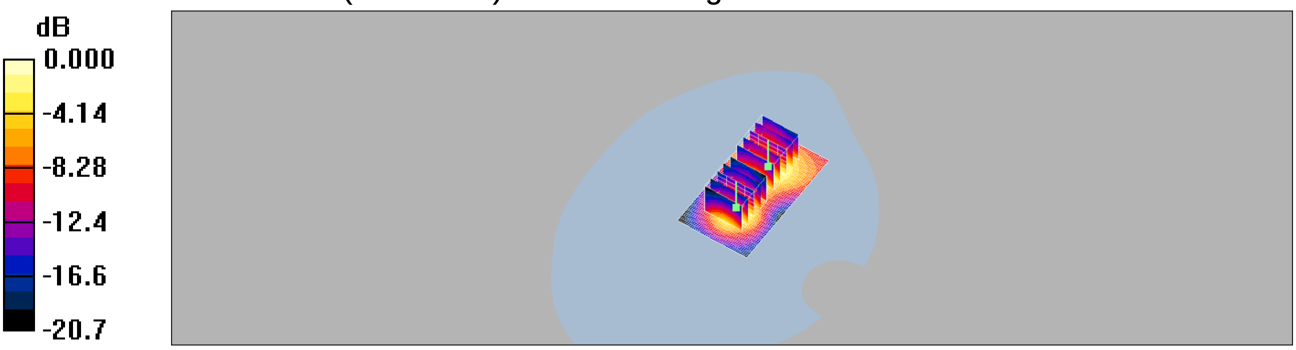
Date: 2012/2/6

Horizontal down_ Mid CH

Communication System: Zigbee; Frequency: 2440 MHz;Duty Cycle: 1:1
Medium: Muscle 2450 Medium parameters used: f = 2440 MHz; σ = 1.9 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(6.96, 6.96, 6.96); Calibrated: 2011/4/19
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2011/8/29
- Phantom: SAM1; Type: SAM 4.0; Serial: TP:1419
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

BODY/Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.752 mW/g
BODY/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.37 V/m; Power Drift = -0.146 dB
Peak SAR (extrapolated) = 0.938 W/kg
SAR(1 g) = 0.513 mW/g; SAR(10 g) = 0.273 mW/g
Maximum value of SAR (measured) = 0.717 mW/g
BODY/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.37 V/m; Power Drift = -0.146 dB
Peak SAR (extrapolated) = 0.969 W/kg
SAR(1 g) = 0.476 mW/g; SAR(10 g) = 0.225 mW/g
Maximum value of SAR (measured) = 0.683 mW/g



0 dB = 0.683mW/g

Vertical front_ Mid CH

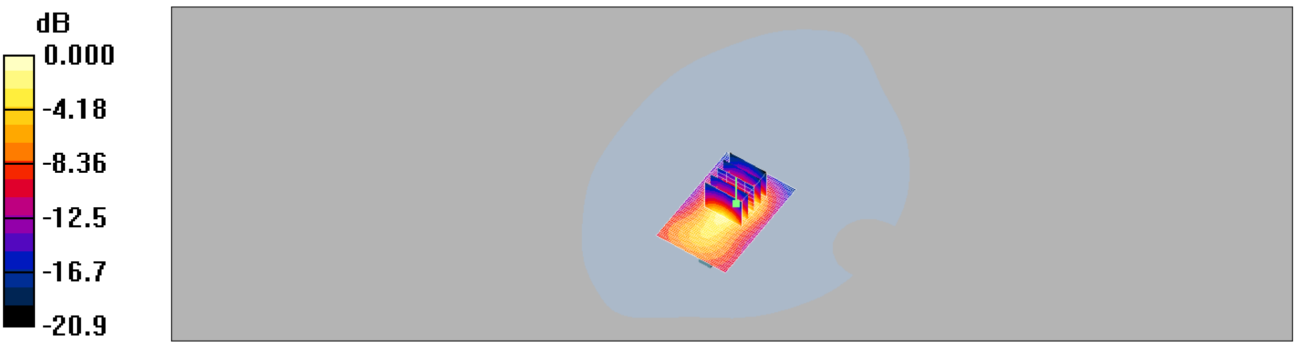
Communication System: Zigbee; Frequency: 2440 MHz;Duty Cycle: 1:1
Medium: Muscle 2450 Medium parameters used: f = 2440 MHz; σ = 1.9 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(6.96, 6.96, 6.96); Calibrated: 2011/4/19
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2011/8/29
- Phantom: SAM1; Type: SAM 4.0; Serial: TP:1419
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

BODY/Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.800 mW/g

BODY/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.09 V/m; Power Drift = -0.146 dB
Peak SAR (extrapolated) = 1.00 W/kg
SAR(1 g) = 0.504 mW/g; SAR(10 g) = 0.248 mW/g
Maximum value of SAR (measured) = 0.744 mW/g



0 dB = 0.744mW/g

Date: 2012/2/6

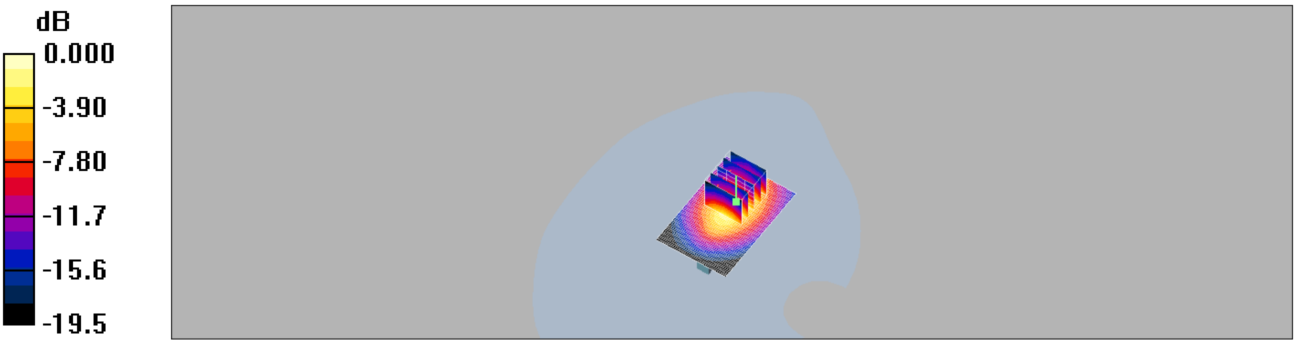
Vertical back_ Mid CH

Communication System: Zigbee; Frequency: 2440 MHz;Duty Cycle: 1:1
Medium: Muscle 2450 Medium parameters used: f = 2440 MHz; σ = 1.9 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(6.96, 6.96, 6.96); Calibrated: 2011/4/19
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2011/8/29
- Phantom: SAM1; Type: SAM 4.0; Serial: TP:1419
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

BODY/Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.580 mW/g
BODY/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.45 V/m; Power Drift = 0.028 dB
Peak SAR (extrapolated) = 0.736 W/kg
SAR(1 g) = 0.381 mW/g; SAR(10 g) = 0.191 mW/g
Maximum value of SAR (measured) = 0.553 mW/g



0 dB = 0.553mW/g

Date: 2012/2/6

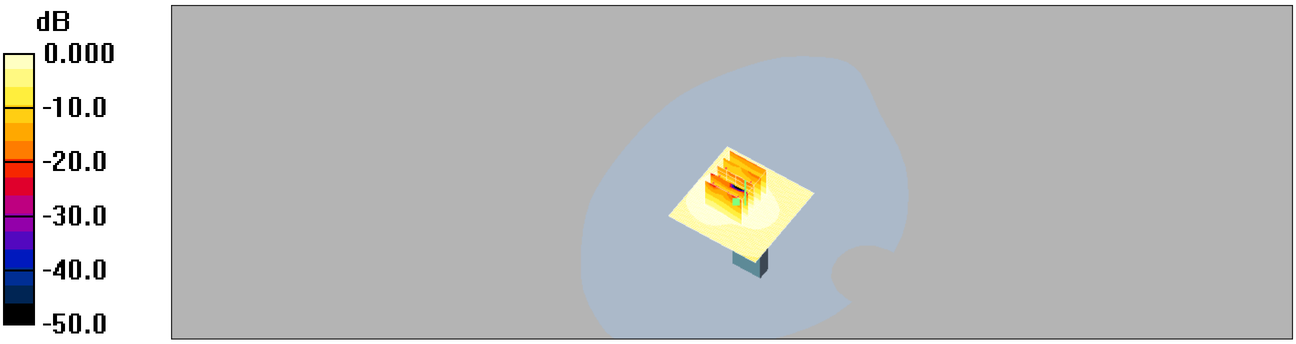
Tip side_ Mid CH

Communication System: Zigbee; Frequency: 2440 MHz;Duty Cycle: 1:1
Medium: Muscle 2450 Medium parameters used: f = 2440 MHz; σ = 1.9 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(6.96, 6.96, 6.96); Calibrated: 2011/4/19
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2011/8/29
- Phantom: SAM1; Type: SAM 4.0; Serial: TP:1419
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

BODY/Area Scan (51x51x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.064 mW/g
BODY/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.23 V/m; Power Drift = -0.074 dB
Peak SAR (extrapolated) = 0.097 W/kg
SAR(1 g) = 0.046 mW/g; SAR(10 g) = 0.026 mW/g
Maximum value of SAR (measured) = 0.071 mW/g



0 dB = 0.071mW/g

5. SAR System Performance Verification

Date: 2012/2/6

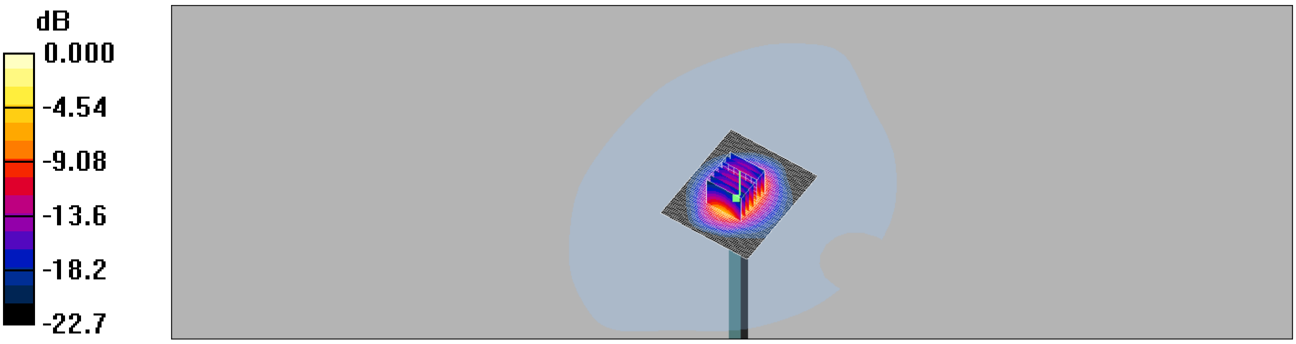
DUT: Dipole 2450 MHz;

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: Muscle 2450 Medium parameters used: f = 2450 MHz; σ = 1.92 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3770; ConvF(6.96, 6.96, 6.96); Calibrated: 2011/4/19
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn547; Calibrated: 2011/8/29
- 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) = 17.1 mW/g
Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 85.9 V/m; Power Drift = -0.175 dB
Peak SAR (extrapolated) = 26.5 W/kg
SAR(1 g) = 12.6 mW/g; SAR(10 g) = 5.82 mW/g
Maximum value of SAR (measured) = 19.4 mW/g



0 dB = 19.4mW/g

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
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**

Certificate No: **DAE4-547_Aug11**

CALIBRATION CERTIFICATE

Object: DAE4 - SD 000 D04 BJ - SN: 547

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

Calibration date: August 29, 2011

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	28-Sep-10 (No:10376)	Sep-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Calibrator Box V1.1	SE UMS 006 AB 1004	08-Jun-11 (in house check)	In house check: Jun-12

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

Issued: August 29, 2011

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

Certificate No: DAE4-547_Aug11 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: 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 Bomholt	R&D Director	F. Bomholt

Issued: April 19, 2011

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

Robert Chang

SGS Taiwan Ltd. No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei County, Taiwan. / 台北縣五股工業區五工路136之1號
台灣檢驗科技股份有限公司 t (886-2) 2299-3939 f (886-2) 2299-9489 www.sgs.com.tw

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

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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

SGS Taiwan Ltd. 台灣檢驗科技股份有限公司 | No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei County, Taiwan. / 台北縣五股工業區五工路136之1號
t (886-2) 2299-3939 f (886-2) 2299-9489 www.sgs.com.tw

Probe EX3DV4

SN:3770

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

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

SGS Taiwan Ltd. No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei County, Taiwan. / 台北縣五股工業區五工路136之1號
台灣檢驗科技股份有限公司 t (886-2) 2299-3939 f (886-2) 2299-9489 www.sgs.com.tw

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (μV/(V/m)^2)[A]	0.32	0.62	0.40	± 10.1 %
DCP (mV)[B]	106.6	98.3	102.8	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	120.8	±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%.

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

SGS Taiwan Ltd. 台灣檢驗科技股份有限公司 | No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei County, Taiwan. / 台北縣五股工業區五工路136之1號
t (886-2) 2299-3939 f (886-2) 2299-9489 www.sgs.com.tw

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
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	0.58	± 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 %

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

SGS Taiwan Ltd. 台灣檢驗科技股份有限公司 | No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei County, Taiwan. / 台北縣五股工業區五工路136之1號
t (886-2) 2299-3939 f (886-2) 2299-9489 www.sgs.com.tw

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

Calibration Parameter Determined in Body Tissue Simulating Media

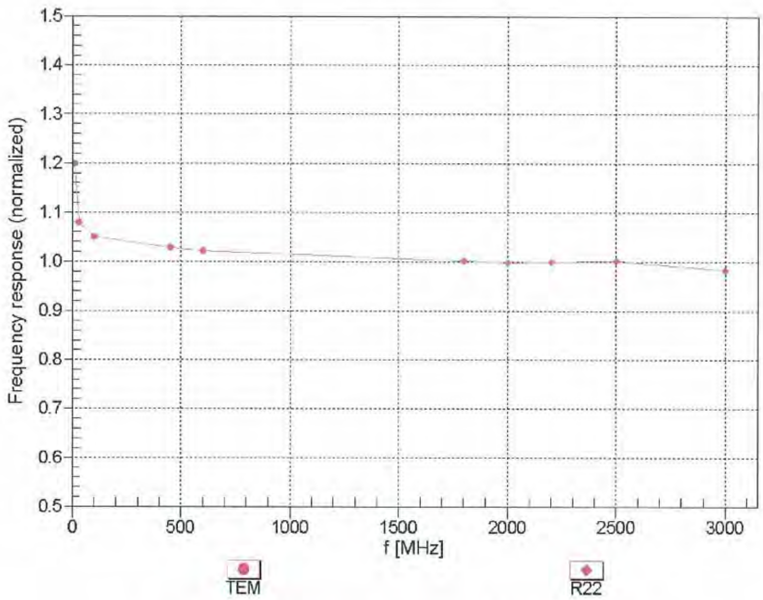
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	9.42	9.42	9.42	0.73	0.72	± 12.0 %
835	55.2	0.97	9.30	9.30	9.30	0.72	0.72	± 12.0 %
900	55.0	1.05	9.12	9.12	9.12	0.73	0.75	± 12.0 %
1750	53.4	1.49	7.84	7.84	7.84	0.80	0.68	± 12.0 %
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 %

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

SGS Taiwan Ltd. 台灣檢驗科技股份有限公司 | No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei County, Taiwan. / 台北縣五股工業區五工路136之1號
t (886-2) 2299-3939 f (886-2) 2299-9489 www.sgs.com.tw

Frequency Response of E-Field

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

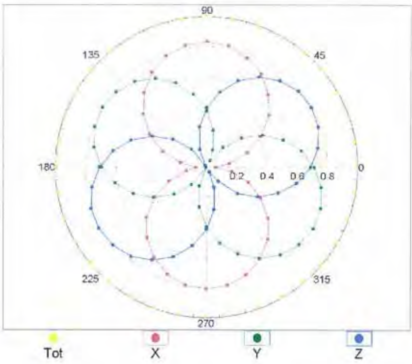


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

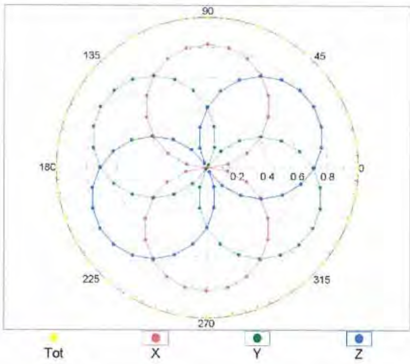
SGS Taiwan Ltd. No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei County, Taiwan. / 台北縣五股工業區五工路136之1號
台灣檢驗科技股份有限公司 t (886-2) 2299-3939 f (886-2) 2299-9489 www.sgs.com.tw

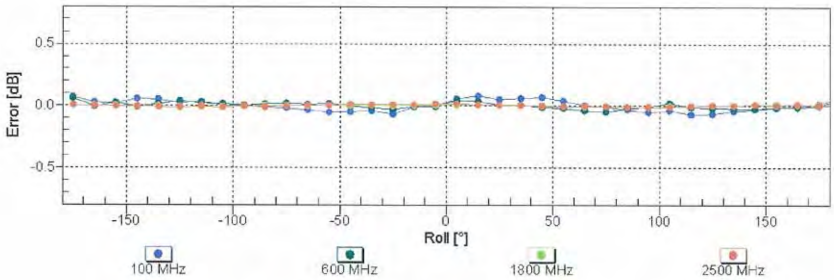
Receiving Pattern (ϕ), $\vartheta = 0°$

f=600 MHz,TEM



f=1800 MHz,R22



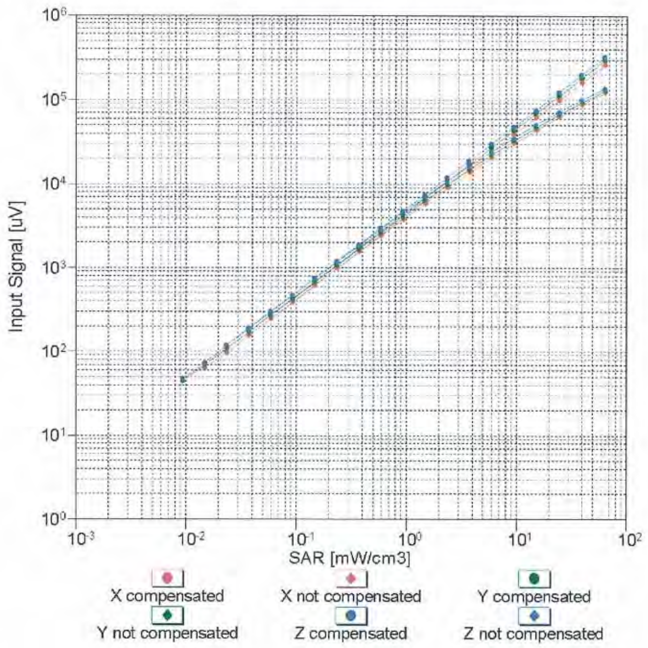


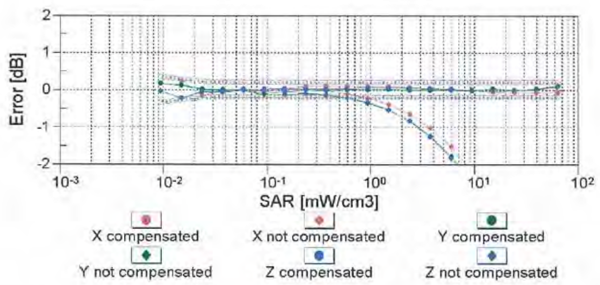
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

SGS Taiwan Ltd. | No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei County, Taiwan. / 台北縣五股工業區五工路136之1號
台灣檢驗科技股份有限公司 | t (886-2) 2299-3939 f (886-2) 2299-9489 www.sgs.com.tw

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

(TEM cell , f = 900 MHz)



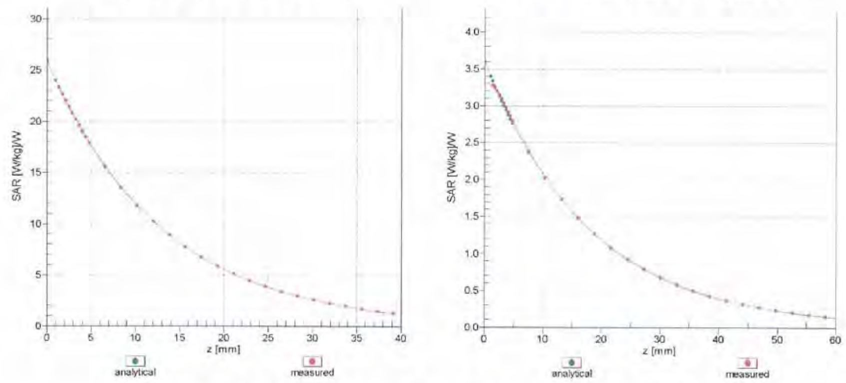


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

SGS Taiwan Ltd. 台灣檢驗科技股份有限公司 | No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei County, Taiwan. / 台北縣五股工業區五工路136之1號
t (886-2) 2299-3939 f (886-2) 2299-9489 www.sgs.com.tw

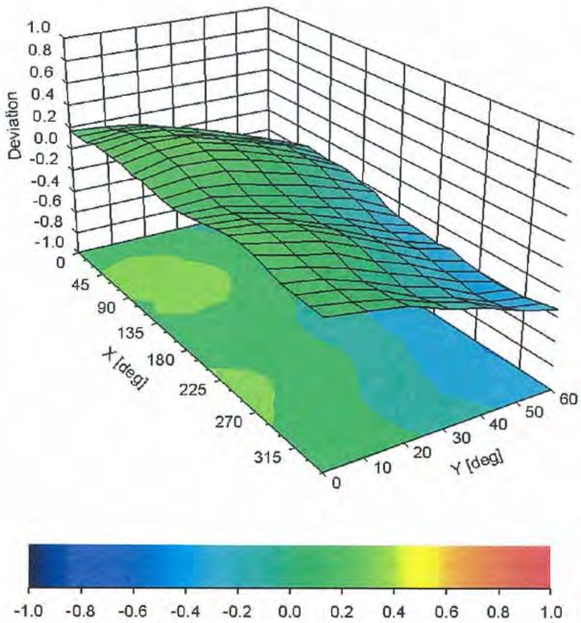
Conversion Factor Assessment

f = 1750 MHz,WGLS R22 (H_convF) f = 900 MHz,WGLS R9 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

SGS Taiwan Ltd. | No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei County, Taiwan. / 台北縣五股工業區五工路136之1號
台灣檢驗科技股份有限公司 | t (886-2) 2299-3939 f (886-2) 2299-9489 www.sgs.com.tw

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

SGS Taiwan Ltd. 台灣檢驗科技股份有限公司 | No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei County, Taiwan. / 台北縣五股工業區五工路136之1號
t (886-2) 2299-3939 f (886-2) 2299-9489 www.sgs.com.tw

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
Measurement system								
Probe calibration (Frequency below 2GHz)	6.0%	N	1	1	1	6.0%	6.0%	∞
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	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%	∞
Test Sample related								
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%	∞
Phantom and Setup								
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 permitivity(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%	

SGS Taiwan Ltd. 台灣檢驗科技股份有限公司 | No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei County, Taiwan. / 台北縣五股工業區五工路136之1號
t (886-2) 2299-3939 f (886-2) 2299-9489 www.sgs.com.tw

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: 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

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

Issued: April 19, 2011

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

Certificate No: D2450V2-727_Apr11 Page 1 of 9

SGS Taiwan Ltd. 台灣檢驗科技股份有限公司 | No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei County, Taiwan. / 台北縣五股工業區五工路136之1號
t (886-2) 2299-3939 f (886-2) 2299-9489 www.sgs.com.tw

DASY5 Validation Report for Body TSL

Date/Time: 19.04.2011 14:37:11

Test Laboratory: SPEAG, Zurich, Switzerland

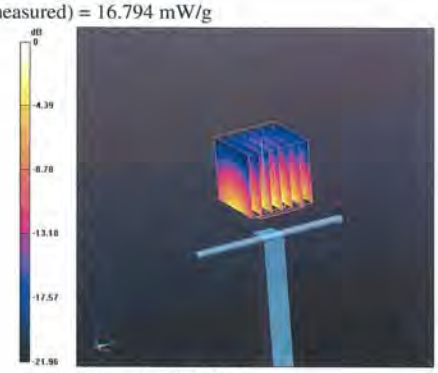
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:727

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: MSL U12 BB
Medium parameters used: f = 2450 MHz; σ = 1.91 mho/m; ε_r = 50.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.31, 4.31, 4.31); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 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



0 dB = 16.790mW/g

Certificate No: D2450V2-727_Apr11 Page 8 of 9

End of 1st part of report