

Appendix C

Phantom Description

Schmid & Panner Engineering AG	S	p	e	a	g	-
Zeughausstrasse 43, BOD+ Zunch, Switzerland, Phone +41 1 245 9700; Fax +41 1 245 9779 mfo@epsig.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 line imitation 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 sories first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been releated 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 standarda	6mm +/- 0.2mm at ERP	First article, All items
Material parameters	Dielectric parameters for required Mequancies	300 MHz - 0 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 fissue simulating liquid	< 1% typical < 0.8% if slied with 155mm of HSL900 and without OUT below	Prototypes, Sample testing

Standards

- CENELEC EN 50361 IEEE Std 1528-2003
- (1)(3)(1)
- IEC 62209 Part 1 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]

07.07.2005

Date

Signature / Stamp

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Doc He MIT - 00 000 P40 C - *

1115 Page

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www.tw.sas.com



System Validation from Original Equipment Supplier

Engineering AG ughausstrasse 43, 8004 Zurict	1, Switzerland		Service suise d'étaionnage Service suise d'étaionnage Servicio svizzero di taratura Swiss Calibration Service
teredited by the Swise Accredita te Swise Accreditation Service ultilateral Agreement for the re	is one of the signatories	s to the EA	Accreditation No.: SCS 0108
lient SGS-TW (Aude	n)	Certificate	No: D2450V2-727_Apr18
CALIBRATION C	ERTIFICATE		
Hijert.	D2450V2 - SN:72	27	
Calibration proceedure(s)	QA CAL-05.v10 Calibration proce	dure for dipole validation kits a	bove 700 MHz
Calibration date:	April 24, 2018		
The measurements and the unce		ry tacility: environment temperature (22 ± :	lynG and humicity < 70%
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Member of SGS Group



Calibration Laboratory of Schmid & Partner Engineering AG # 43, 8904 Zurich, Switzerland



Sanweizerischer Kallbrierdi Service suisse d'étalormage C Servizio evizzeno di taratura Swiss Calibration Service

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Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accred	Itation Service is one of the signatories to the EA
Multilateral Agree	ment for the recognition of colliberation commissive
Glossary:	
TSL	tissue simulating liquid
Com	momental day in TOL / MOTHER was a

ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless -0) communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented. parallel to the body axis.
- Feed Point impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point.
- No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

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

Certificate No: 02450V2/727_A0/18

Page 2 of 6

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f (886-2) 2298-0488



Measurement Conditions

DASY Version	DASYS	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz = 1 MHz	

Head TSL parameters

The following parameters and calculations were applied

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 "C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.3 ± 8 %	1.86 mha/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL

SAR averaged over 1 cm ⁵ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.3 W/kg
SAR for nominal Head TSL parameters	Wt of besilemon	52.1 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR averaged over 10 cm ³ (10 g) of Head TSL SAR measured	condition 250 mW input power	8.16 Wikg

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.5 ± 6 %	2.01 mhc/m = € %.
Body TSL temperature change during test	< 0,5 °C	_	(1997)

SAR result with Body TSL

SAR sveraged over 1 cm ¹ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.9 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	50.8 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR averaged over 10 cm ³ (10 g) of Body TSL. SAR measured	condition 250 mW input power	6.00 W/kg

Centricale No: D2450V2-727_Apr18

Page 3 of 8

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Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	55.2 Ω + 2.7 jΩ
Return Loss	= 25.1 dB

Antenna Parameters with Body TSL

Incledance, transformed to lead point	51.2 Q + 5.6 (Q
Return Loss	- 25.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.149 ns
Electricity neurol force successful	1111010

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

The dipole is made of standard semingid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG	
Manufactured on	January 09, 2003	

Certificate No: D2450V2+727_Apr18

Page 4 of E

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DASY5 Validation Report for Head TSL

Date: 24.04.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

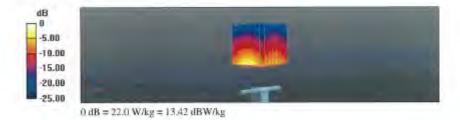
Communication System: UID 0 - CW; Frequency: 2450 MHz Medium parameters used: f = 2450 MHz; $\sigma = 1.86 \text{ S/m}$; $\epsilon_t = 38.3$; $\rho = 1000 \text{ kg/m}^3$ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(7.88, 7.88, 7.88); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection) •
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 116.0 V/m; Power Drift = -0.06 dB Peak SAR (extrapolated) = 26.7 W/kg

SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.16 W/kg Maximum value of SAR (measured) = 22.0 W/kg



Certificate No: D2450V2-727_April8

Page 5 of 8

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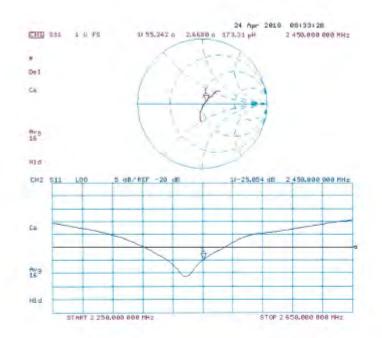
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Impedance Measurement Plot for Head TSL



Certificate No: D2450V2-727 Apr18

Page 6 of 8

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DASY5 Validation Report for Body TSL

Date: 24.04.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

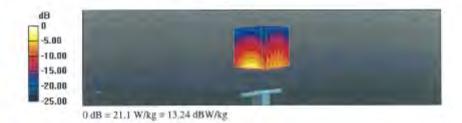
Communication System: UID 0 - CW; Frequency: 2450 MHz Medium parameters used: f = 2450 MHz; $\sigma = 2.01$ S/m; $v_r = 52.5$; $\rho = 1000$ kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(8.01, 8.01, 8.01); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002 .
- DASY52 52:10.0(1446); SEMCAD X 14.6.10(7417)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 108.4 V/m; Power Drift = -0.07 dB Peak SAR (extrapolated) = 25.5 W/kg SAR(1 g) = 12.9 W/kg; SAR(10 g) = 6 W/kg Maximum value of SAR (measured) = 21.1 W/kg



Certificate No: D2450V2-727 April8

Page 7 of 8

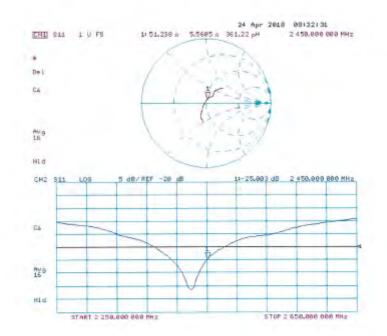
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Impedance Measurement Plot for Body TSL





- End of report -

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