

HCTA1307FS07 FCC ID: V65C6522 Date of Issue: Jul. 12, 2013 Report No .:

ETIDV6- SN:1798 April 29, 2013

## DASY/EASY - Parameters of Probe: ET3DV6 - SN:1798

#### Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) C	Relative Permittivity <sup>®</sup>	Conductivity (S/m)	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unet. (k=2)
450	43.5	087	7.74	7.74	7.74	0.23	2.32	± 13.4 %
750	41.9	0.89	7.00	7.00	7,00	0.31	2,62	± 12.0 %
835	41.5	0.90	6.64	6.64	6.64	0.33	2.51	± 12.0 %
900	41.5	0.97	6.54	6.54	6.54	0.41	2.21	± 12.0 %
1450	40,5	1.20	5,55	5.55	5.55	0.45	3.00	± 12.0 %
1750	40,1	1.37	5,51	5.51	5.51	0.69	2.28	± 12,3 %
1900	40.0	1.40	5.29	5.29	5.29	0.80	2.16	±12.0 %
1950	40.0	140	5.09	5.09	5.09	0.80	2.23	± 12.0 %
2450	39.2	1.80	4.63	4.63	4.63	0.80	1.82	± 12.0 %

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Frequency velidity 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 bond.

Attriquencies below 3 GHz, the validity of tissee parameters (c and r) can be relaxed to ± 10% if figure compensation formula at applied to measured SAR values. Attriquencies above 3 OHz, the validity of fissie parameters (c and r) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.



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## DASY/EASY - Parameters of Probe: ET3DV6 - SN:1798

## Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) <sup>C</sup>	Relative Permittivity	Conductivity (S/m)	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	8.11	8.11	8.11	0.23	2.33	+134%
750	55.5	0.96	6.62	6,62	6.62	0.26	3.00	± 12.0 %
835	55.2	0.97	6.46	6.46	6.46	0.41	2,30	± 12.0 %
1750	53.4	1.49	4.93	4.93	4.93	0.80	2.42	± 12.0 %
1900	53.3	1.52	4.70	4.70	4.70	0.80	2.35	± 12.0 %
2450	52.7	1.95	4.16	4.16	4.16	0.63	1.15	± 12.0 %

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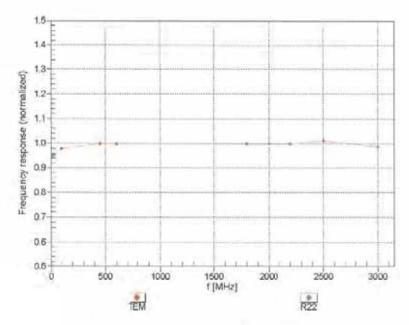
Frequency validity of z 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to z 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
Affrequencies below 3 GHz, the validity of tissue parameters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



ET3DV6- SN:1798

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



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

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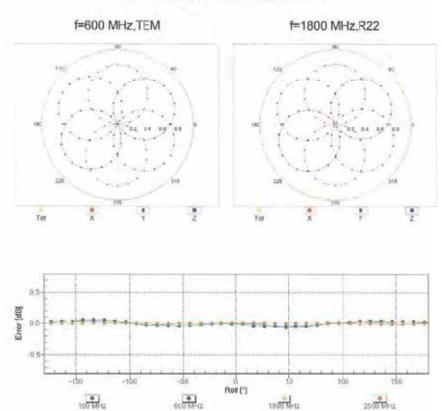
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ET3DV6+ SN:1798

# Receiving Pattern (φ), 9 = 0°



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

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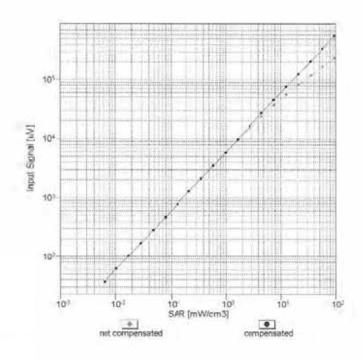
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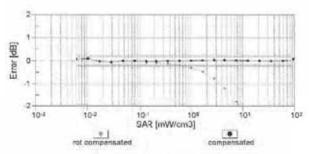
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## Dynamic Range f(SAR<sub>head</sub>) (TEM cell, f = 900 MHz)





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

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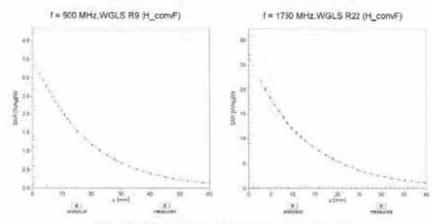
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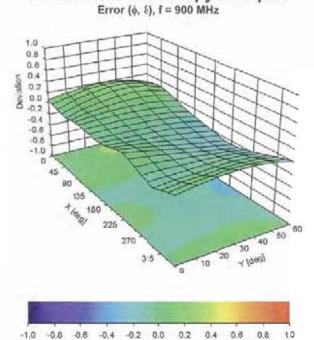


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## Conversion Factor Assessment



## Deviation from Isotropy in Liquid



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



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## DASY/EASY - Parameters of Probe: ET3DV6 - SN:1798

#### Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (")	56.4
Machanical Surface Detection Mode	enstled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	6.8 mm
Probe Tip to Sensor X Calibration Point	2.7 mm
Probe Tip to Sensor Y Calibration Point	2.7 mm
Probe Tip to Sensor Z Calibration Point	2.7 mm
Recommended Measurement Distance from Surface	4 mm

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# **Attachment 4. – Dipole Calibration Data**

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





Schweizerischer Kalibrierdienst S Service suisse d'étatonsage C 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 certificares Accreditation No.: SCS 108

Calibration procedure(s)  QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz  Calibration procedure for dipole validation kits above 700 MHz  This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The reasurements 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 lumidity < 70%.  Calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and lumidity < 70%.  Calibrations Equipment used (M&TE critical for cultigration)  Primary Standards  ID # Calibration 05-0c-s11 (No. 217-01451) Oct-12  Power enricht PB-481A US37292983 O5-0c-s11 (No. 217-01451) Oct-12  Power enricht PB-481A SNo 50472 / 06327 27-Ma-12 (No. 217-01451) Oct-12  SNo 601 27-Ma-12 (No. 217-01530) Apr-13  SNo 601 27-Ma-12 (No. 217-01530) Apr-13  SNo 601 27-Ma-12 (No. 217-01530) Apr-13  SNo 601 27-Jun 12 (No. DAE4-601_nun12) Jun-13  Secondary Standards  ID # Check Date (in house) Scheduled Check  Network Analyzer HP 881A MY41092117 18-Oct-02 (in house check Oct-11) In house check Oct-13  Network Analyzer HP 8753E US37739098 S4206  Name Function Signature  Ware CL-Ocal  Approved by: Kalja Pokoric Technical Manager	CALIBRATION C		E. W.	man ter (f. 18) see t. Le Con See T. Mar. Ball
Calibration procedure for dipole validation kits above 700 MHz  Calibration date:  July 18, 2012  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 (32 ± 3)°C and humidity < 70%.  Calibration Equipment used (M&TE critical for calibration)  Primary Standards  ID # Gal Date (Certificate No.) Scheduled Calibration  Primary Standards  ID # Gal Date (Certificate No.) Scheduled Calibration  Primary Standards  ID # Gal Date (Certificate No.) Scheduled Calibration  Primary Standards  ID # Gal Date (Certificate No.) Scheduled Calibration  Oct-12  Reference 20 dB Attenuator SNc 5058 2060 27 -Mai-12 (No. 217-01451) Oct-12  Reference 20 dB Attenuator SNc 5058 2060 27 -Mai-12 (No. 217-01530) Apr-13  Reference Probe ES3DV3 SNc 5047 27 06327 27 -Mai-12 (No. 217-01530) Apr-13  Reference Probe ES3DV3 SNc 5047 27 06327 27 -Mai-12 (No. 217-01530) Apr-13  Power sensor Probe ES3DV3 SNc 5047 27 06327 27 -Mai-12 (No. 217-01530) Apr-13  Power Sensor Probe ES3DV3 SNc 5047 27 06327 30 -De-11 (No. ES3-3205, 0ec11) Dec-12  SNc 5047 27 -Mai-12 (No. DAE4-601 _unit2) Jun-13  Secondary Standards  ID # CheckDate (in house) Scheduled Check  Power Sensor HP 8481A MY41082517 18 -Oct-02 (in house check Oct-11) In house check Oct-13  Reference Res SNrt-06 100005 04-Aug-99 (in house check Oct-11) In house check Oct-13  Name Function States Function Signature	Object	D750V3 - SN: 10	014	
This calibration certificate documents the traceability to national stardards, which realize the physical units of measurements (SI). The neasurements 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    D #   Cal Date (Certificate No.)   Scheduled Calibration  Power moter EPM-442A   GB37480104   05-Oct11 (No. 217-01451)   Oct-12  Power sensor HP 8481A   U53729283   05-Oct11 (No. 217-01451)   Oct-12  Reference 20 dB Attenuator   SN: 5058 (200)   27-Ma-12 (No. 217-01451)   Oct-12  Reference Probe ES3DV3   SN: 5047 2 / 06327   27-Ma-12 (No. 217-014530)   Apr-13  Reference Probe ES3DV3   SN: 5047 2 / 06327   27-Ma-12 (No. 0AE4-501_ctn12)   Jun-13  DAE4   SN: 601   27-Jun-12 (No. 0AE4-501_ctn12)   Jun-13  Secondary Standards   ID #   Check Date (in house)   Scheduled Check  Power sensor HP 8481A   MY41092317   18-Oct-02 (at house check Oct-11)   In house check Oct-13  Reference RSS SMT-06   100005   U537190685 S4206   18-Oct-01 (in house check Oct-11)   In house check Oct-13  Name   Function   Signature	Calibration procedure(s)	Committee of the Commit	dure for dipole validation kit	s above 700 MHz
The ineseurements 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 oritoration)  Primary Standards   ID #   Gal Date (Certificate No.)   Scheduled Calibration    Prower marker EPM-442A   GB37480704   D5-Oct-11 (No. 217-01451)   Oqt-12    Power sensor HP 8481A   U53729285   O5-Oct-11 (No. 217-01451)   Oct-12    Reference 20 dB Attenuator   SN: 5059 (20k)   27-Mai-12 (No. 217-01530)   Apr-13    Reference Probe ES3DV3   SN: 3205   30-Det-11 (No. ES3-3205, Dec11)   Dec-12    DAET   SN: 601   27-Jun-12 (No. DAE4-601_abr12)   Jun-13    Secondary Standards   ID #   Check Date (in house)   Scheduled Check    Power sensor HP 8481A   MY41082517   18-Oct-02 (in house check Oct-11)   In house check Oct-13    Network Analyzer HP 8753E   US37390685 S4206   18-Oct-01 (in house check Oct-11)   In house check Oct-12    Name   Function   Signature	Calibration data:	July 18, 2012		
Power moter EPM-442A GB37480304 05-Oct-11 (No. 217-01451) Oct-12 Power sensor HP 8481A U53729283 05-Oct-11 (No. 217-01451) Oct-12 Reference 20 dB Attenuator SNc 5058 (20k) 27-Mai-12 (No. 217-01530) Apr-13 Reference Probe ES3DV3 SNc 3205 30-Oct-11 (No. ES3-3205, Dec11) Dec-12 DAEC SNc 601 27-Jun-12 (No. DAE4-601_Jun-12) Jun-13 Secondary Standards ID & Check Date (in house) Scheduled Check Power sensor HP 8481A MY41092317 18-Oct-02 (in house check Oct-11) In house check Oct-13 Reference RS SMT-06 100005 D4-Aug-99 (in house check Oct-11) In house check Oct-13 Network Analyzer HP 8753E US37390685 \$4206 18-Oct-01 (in house check Oct-11) In house check Oct-12	All calibrations have been conduc	ted in the closed laborato		
Description   Property   Proper	Primary Standards	line	Cal Date /Certificate No. i	Schurbilled Calibration
Selection   Sele	ower motor EPM-442A	GB37460704	05-Oct-11 (No. 217-01451)	Oof-12
SN: 5047.27.06327   27-Mai-12 (No. 217-01533)   Apr-13			* - 그, 저성한 (1880년 : 이성 전략) 이번 (1870년 ) 이 시스 및 경우 (1	
AE4 SN: 601 27-Jun-12 (No. DAE4-601_Jun-12) Jun-13 scondary Standards ID # Check Date (in house) Scheduled Check owie sensor HP 8481A MY41092317 18-Oct 02 (in house check Oct-11) In house check Oct-13 Figurerator R&S SMT-06 100005 D4-Aug-99 (in house check Oct-11) In house check Oct-13 etwork Analyzer HP 8753E US37/390685 \$4206 18-Oct 01 (in house check Oct-11) In house check Oct-12  Name Function Signature		THE RESERVE OF THE PARTY OF THE		And the second s
Scheduled Check  Directorary Standards  ID ii Check Date (in house)  Scheduled Check  Directorary Standards  MY41092317  18-Oct02 (in house check Oct-11)  In house check Oct-13  In house check Oct-12  Name  Function  Signature	efeance Probe ES3DV3	SN: 3205	30-Der-11 (No. ES3-3205, Dec11)	Dec-12
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Name Function Signature		100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Talibustad box	letwork Analyzer HP 8753E	US37390585 S4206	18-Oct01 (in house check Oct-11)	in house check: Oct-12
Patibolish for Strong Change Control C		Name	Function	Signature
oproved by: Katja Pokovic Technical Manager CO Ins	Calibrated by:	Israe El-Naouq		^
866	approved by:	Katja Pokovic	Technical Manager	El 19

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#### Calibration Laboratory of Schmid & Partner

Schmid & Partner
Engineering AG
Zeughausstresse 43, 8004 Zurich, Switzerland







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

Accreditation No.: SCS 108

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

#### Glossary:

TSL tissue simulating liquid

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

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

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices Measurement Techniques", December 2003
- b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

#### Additional Documentation:

d) DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end
  of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed
  point exactly below the center marking of the flat phantom section, with the arms oriented
  parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole
  positioned under the liquid filled phanton. 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 artenna connector.
- SAR for nominal TSL paremeters: 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 ocverage probability of approximately 95%.

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#### Measurement Conditions

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

DASY Version	DASY5	V52.8.1
Extrapolation	Advanced Extrapolation	
Phantom	Mcdular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	cx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	

## Head TSL parameters

The following parameters and calculations were applied

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) "C	40.4 ± 6 %	0.89 mhom ± 6 %
Head TSL temperature change during test	< 0.5 °C	****	144

## SAR result with Head TSL

SAR averaged over 1 cm3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.10 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	8.33 mW/g ± 17.0 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.38 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	5.49 mW /g ± 16.5 % (k=2)

## **Body TSL parameters**

The following parameters and calculations were applied

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.4 ± 6 %	0.95 mha/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	7777	

#### SAR result with Body TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.18 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	8.75 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.44 mW / g
SAR for nominal Body TSL parameters	normalized to TW	5.78 mW / g ± 16.5 % (k=2)

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#### Appendix

#### Antenna Parameters with Head TSL

Impedance, transformed to feed point	55.9 Ω + 3.3 jΩ		
Return Loss	- 23.9 dB		

#### Antenna Parameters with Body TSL

Impedance, transformed to feed point	51.0 Ω + 0.8 jΩ	
Return Loss	-38.4 dB	

#### General Antenna Parameters and Design

Electrical Delay (one direction)	1.037 ns
THE PROPERTY OF THE PROPERTY O	11922 (10)

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

The dipole is made of standard semirigid poaxial 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 band or the soldered connections near the feedpoint may be damaged.

#### Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 22, 2010

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#### **DASY5 Validation Report for Head TSL**

Date: 18.07.2012

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Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1014

Communication System: CW; Frequency: 750 MHz

Medium parameters used; f = 750 MHz;  $\sigma = 0.89 \text{ mho/m}$ ;  $\varepsilon_t = 40.4$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

#### DASY52 Configuration:

Probe: ES3DV3 - SN3205; ConvF(6.33, 6.33, 6.33); Calibrated: 30.12,2011;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn601; Calibrated: 27.06.2012

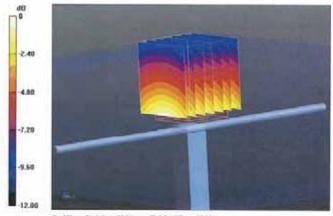
Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001

DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

#### Dipole Calibration for Head Tissue/Pin=250mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 53.729 V/m, Power Drift = 0.01 dB Peak SAR (extrapolated) = 3.190 mW/g SAR(1 g) = 2.1 mW/g; SAR(10 g) = 1.38 mW/g

Maximum value of SAR (measured) = 2.46 mW/g



0 dB = 2.46 mW/g = 7.82 dB mW/g

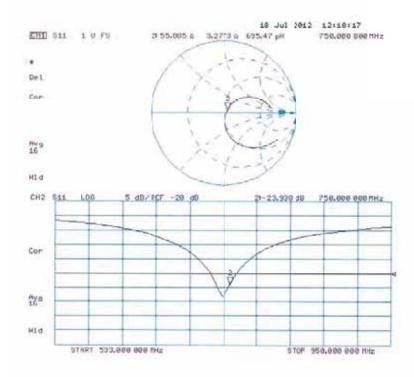
Certificate No: D750V3-1014\_Jul12

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## Impedance Measurement Plot for Head TSL



Certificate No: D750V3-1014\_Jul12 Page 6 of 8



#### **DASY5 Validation Report for Body TSL**

Date: 18.07.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1014

Communication System: CW; Frequency: 750 MHz

Medium parameters used: f = 750 MHz;  $\sigma = 0.95 \text{ mho/m}$ ;  $\varepsilon_r = 54.4$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

#### DASY52 Configuration:

Probe: ES3DV3 - SN3205; ConvF(6.12, 6.12, 6.12); Calibrated: 30.12.2011;

· Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn601; Calibrated: 27.06.2012

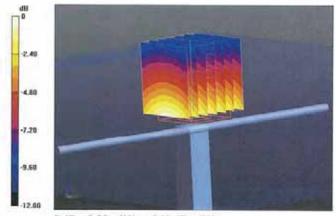
· Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001

DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

#### Dipole Calibration for Body Tissue/Pin=250mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 52.921 V/m; Power Drift = 0.03 dB Peak SAR (extrapolated) = 3.263 mW/g SAR(1 g) = 2.18 mW/g; SAR(10 g) = 1.44 mW/g

Maximum value of SAR (measured) = 2.55 mW/g

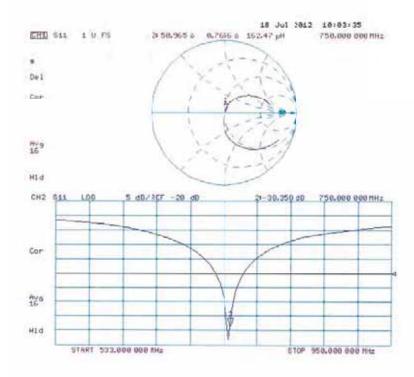


0 dB = 2.55 mW/g = 8.13 dB mW/g

Certificate No: D750V3-1014\_Jul12 Page 7 of 8



## Impedance Measurement Plot for Body TSL



Certificate No: D750V3-1014\_Jul12

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





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The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Certificate No: D835V2-441 Apr13

Accreditation No.: SCS 108

	ERTIFICATE		
Object	D835V2 - SN: 44	Í	
Calibration procedure(s)	QA CAL-05.v9 Calibration proces	dure for dipole validation kits abo	ve 700 MHz
Calibration date:	April 25, 2013		
The measurements and the unce	rtainties with confidence protection the closed laborator	onal standards, which realize the physical unrobability are given on the following pages as $y$ facility: environment temperature (22 $\pm$ 3)%	d are part of the certificate.
Parrary Standards	ID#	Cal Date (Certificate No.)	Scheduled Calibration
Primary Standards Power mater EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3D/3 DAE4	GB37490704 US37292783 SN: 5658 (2016) SN: 5047.3 / 06327 SN: 3205 SN: 907	Gsl Date (Certificate No.) 01-Nov-12 (No. 217-01040) 01-Nov-12 (No. 217-01640) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01736) 28-Dec-12 (No. ES3-3205_Dec12) 11-Sep-12 (No. DAE4909_Sep12)	Scheduled Calibration Oct-13 Oct-13 Apr-14 Apr-14 Dec-13 Sep-13
Power mater EPM-442A Power sensor HP 8481A Reference 20 dB Atteniator Type-N mismatch combination Reference Probe ES3DV3	GB37490704 US37292783 SN: 5058 (2010) SN: 5047.3 / 06327 SN: 3205	01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01739) 26-Dec-12 (No. ES3-3205_Dec12)	Oct-13 Oct-13 Apr-14 Apr-14 One-13
Power mater EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3D/3 DAE4	GB37490704 US37292783 SN: 5658 (2010) SN: 5047.3 / 06327 SN: 3205 SN: 909	01-Nov-12 (No. 217-01040) 01-Nov-12 (No. 217-01640) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01739) 26-Dec-12 (No. ES3-3205_Dec12) 11-Sep-12 (No. DAE4-909_Sep12)	Oct-13 Oct-13 Apr-14 Apr-14 Dec-13 Sep-13
Power mater EPM-442A Power sunsor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A RF generator R&S SMT-08 Network Analyzer HP 8753E	GB37490704 US37292783 SN: 5058 (2010) SN: 5047.3 / 06327 SN: 3205 SN: 909 ID # MY41092317 100005 US37390585 S4206	01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01739) 26-Dec-12 (No. ESS-3205_Dec12) 11-Sep-12 (No. DAE4-809_Sep12) Check Date (in house) 16-Oct-02 (In house check Oct-11) 04-Aug-29 (In house check Oct-11) 18-Oct-01 (in house check Oct-12)	Oct-13 Oct-13 Apr-14 Apr-14 Dec-13 Sep-13 Scheduled Check In house check: Oct-13 In house dheck: Oct-13
Power mater EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Typt-N mismatch combination Reference Probe ES3D/3 DAE4 Secondary Standards Power sensor HP 6481A RF generator R&S SMT-06	GB37490704 US37292783 SN: 5058 (2010) SN: 5047.3 / 06327 SN: 3205 SN: 909 ID # MY41092317 100005 US37390585 84206	01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01739) 26-Dec-12 (No. ESS-3205_Dec12) 11-Sep-12 (No. DAE4809_Sep12) Check Date (in house) 16-Oct-02 (In house check Oct-11) 04-Aug-99 (in house check Oct-11) 18-Oct-01 (in house check Oct-12)	Oct-13 Oct-13 Apr-14 Apr-14 Dec-13 Sep-13 Scheduled Check In house check: Oct-13 In house check: Oct-13 In house check: Oct-13
Power mater EPM-442A Power sunsor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A RF generator R&S SMT-08 Network Analyzer HP 8753E	GB37490704 US37292783 SN: 5058 (2010) SN: 5047.3 / 06327 SN: 3205 SN: 909 ID # MY41092317 100005 US37390585 S4206	01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01739) 26-Dec-12 (No. ESS-3205_Dec12) 11-Sep-12 (No. DAE4-809_Sep12) Check Date (in house) 16-Oct-02 (In house check Oct-11) 04-Aug-29 (In house check Oct-11) 18-Oct-01 (in house check Oct-12)	Oct-13 Oct-13 Apr-14 Apr-14 Dec-13 Sep-13 Scheduled Check In house check: Oct-13 In house check: Oct-13 In house check: Oct-13

Certificate No: D835V2-441\_Apr13

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TEL: +82 31 645 6300 FAX: +82 31 645 6401 www.hct.co.kr



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





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Schweizerischer Kalibrierdienst Service sulsse d'étalennage Servizio svizzero di taratura Swiss Calibration Service

Accreditation No.: SCS 108

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signaturies to the EA Multilateral Agreement for the recognition of calibration certificates

#### Glossary:

TSL tissue simulating liquid

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

## Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

#### Additional Documentation:

d) DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end
  of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The cipole 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: D835V2-441\_Apr13

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HCTA1307FS07 FCC ID: V65C6522 Date of Issue: Jul. 12, 2013 Report No.:

#### Measurement Conditions

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

DASY Version	DASY5	V52.8.6
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

## Head TSL parameters

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) "C	40.8 ± 6 %	0.94 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		-

#### SAR result with Head TSL

SAR averaged over 1 cm3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.51 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.68 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.62 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.30 W/kg ± 16.5 % (k=2)

# Body TSL parameters

	Temperature	Permittivity	Conductivity
Nominal BodyTSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.0 ± 6 %	1.01 mho/m ± 6 %
Body TSL temperature change during test	< 0.5°C	****	****

## SAR result with Body TSL

SAR averaged over 1 cm3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.51 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	9.69 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.64 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	6,38 W/kg ± 16.5 % (k=2)

Certificate No: D835V2-441\_Apr13

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#### Appendix

#### Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.0 Ω - 1.6 jΩ	
Return Loss	- 31.9 dB	

## Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.0 Ω - 4.6 jΩ	
Return Loss	- 24.9 dB	

## General Antenna Parameters and Design

Electrical Delay (one direction)	1,372 ns
Electrical Delay (one direction)	Tayra, no

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

The cipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. 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 torce must be applied to the dipole arms, because they might bend or the saldered connections near the feedpoint may be darraged.

## Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 09, 2001

Certificate No: DB35V2-441\_Apr13

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## **DASY5 Validation Report for Head TSL**

Date: 25.04.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 441

Communication System: UID 0 - CW - Frequency: 835 MHz.

Medium parameters used: f = 835 MHz;  $\sigma = 0.94 \text{ S/m}$ ;  $\varepsilon_r = 40.8$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

#### DASY52 Configuration:

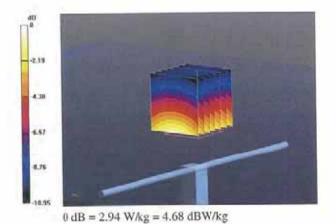
- Probe: ES3DV3 SN3205; ConvF(6.05, 6.05, 6.05); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn909; Calibrated: 11.09.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

## Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 57.617 V/m; Power Drift = 0.01 dB Peak SAR (extrapolated) = 3.84 W/kg

SAR(1 g) = 2.51 W/kg; SAR(10 g) = 1.62 W/kg

Maximum value of SAR (measured) = 2.94 W/kg

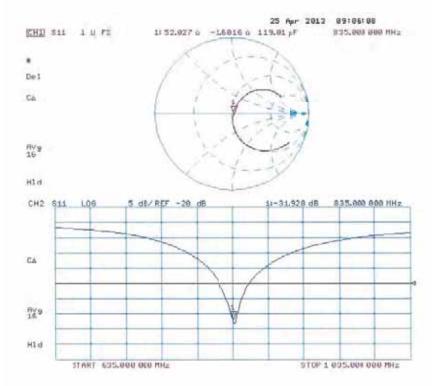


Certificate No: D835V2-441\_Apr13

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## Impedance Measurement Plot for Head TSL



Certificate No: D835V2-441\_Apr13

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## **DASY5 Validation Report for Body TSL**

Date: 24.04.2013

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Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 441

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: f = 835 MHz;  $\sigma = 1.01 \text{ S/m}$ ;  $\varepsilon_r = 54$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

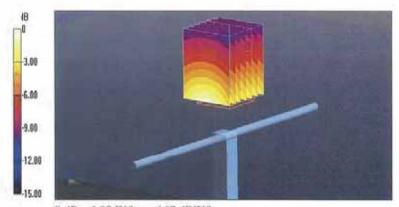
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

#### DASY52 Configuration:

- Probe: ES3DV3 SN3205; ConvF(6.04, 5.04, 6.04); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics DAE4 Sn909. Calibrated: 11.09.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

## Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 55.722 V/m; Power Drift = 001 dB Peak SAR (extrapclated) = 3.72 W/kg SAR(1 g) = 2.51 W/kg; SAR(10 g) = 1.64 W/kg Maximum value of SAR (measured) = 2.93 W/kg



0 dB = 2.93 W/kg = 4.57 dBW/kg

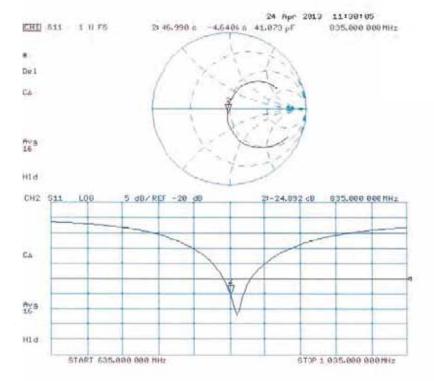
Certricate No: D835V2-441\_Apr13

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## Impedance Measurement Plot for Body TSL



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HCTA1307FS07 FCC ID: V65C6522 Date of Issue: Jul. 12, 2013 Report No .:

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





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HCT (Dumeton)

. .. D1900V2 24007 Ma-12

Accreditation No.: SCS 108

TALIBITIATION C	ERTIFICATE		
Object	D1800V2 - SN: 2	d007	
Calibration procedure(s)	QA CAL-05.v9 Calibration proce	dure for dipole validation kits abo	ove 700 MHz
Calibration date:	March 19, 2013		
	THE RESERVE OF THE PARTY OF THE	ional standards, which realize the physical un robability are given on the following pages ar	
		ry facility: environment temperature (22 $\pm$ 3)*	Cand humidity < 70%.
Calibration Equipment used (M&			Cand humidity < 70%.  Scheduled Calibration
	TE critical for calibration)	ry facility: environment temperature (22 ± 3)**  Cal Date (Certificate No.)  01-Nov-12 (No. 217-01640)	
Calibration Equipment used (M& Primary Standards Power meter EPM-442A Power standar HP 8481A	TE critical for calibration)  ID #  GB37480704 US37292783	Cal Date (Certificate No.) 01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640)	Scheduled Calibration Oct-13 Oct-13
Calibration Equipment used (M& Primary Standards Power meter EPM-442A Power standor HP 8481A Reference 20 dB Attenuator	TE critical for calibration)  ID #  GB37480704 US37292783 SN: 5058 (20k)	Cal Date (Certificate No.) 01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 27-Mar-12 (No. 217-01630)	Scheduled Calibration Oct-13 Oct-13 Apr-13
Calibration Equipment used (M& Primary Standards Power meter EPM-442A Power stansor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination	TE critical for calibration)  ID #  GB37460704  US37292783  SN: 5058 (20k)  SN: 5047.3 / 06327	Cal Date (Certificate No.) 01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 27-Mar 12 (No. 217-01530) 27-Mar-12 (No. 217-01533)	Scheduled Calibration Oct-13 Oct-13 Apr-13 Apr-13
Calibration Equipment used (M& Primary Standards Power meter EPM-442A Power standor HP 8481A Reference 20 dB Attenuator	TE critical for calibration)  ID #  GB37480704 US37292783 SN: 5058 (20k)	Cal Date (Certificate No.) 01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 27-Mar-12 (No. 217-01630)	Scheduled Calibration Oct-13 Oct-13 Apr-13
Calibration Equipment used (M& Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3	TE critical for calibration)  ID #  GB37480704 US37292783 SN: 5058 (20k) SN: 5047.3 / 06327 SN: 3205	Cal Date (Certificate No.) 01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 27-Mar-12 (No. 217-01530) 27-Mar-12 (No. 217-01533) 28-Dec-12 (No. ESS-3205_Dec12)	Scheduled Calibration Oct-13 Oct-13 Apr-13 Apr-13 Dec-13
Calibration Equipment used (M& Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A	TE critical for calibration)  ID #  GB37480704 US37292783 SN: 5058 (20k) SN: 5047.3 / 06327 SN: 3205 SN: 601  ID #  MY41092317	Cal Date (Certificate No.) 01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 27-Mar-12 (No. 217-01530) 27-Mar-12 (No. 217-01530) 28-Dec-12 (No. ES3-3205_Dec12) 27-Jun-12 (No. DAE4-601_Jun12) Check Date (in house)	Scheduled Calibration Oct-13 Oct-13 Apr-13 Apr-13 Dec-13 Jun-13 Scheduled Check In house check: Oct-13
Calibration Equipment used (M& Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A RF generator R&S SMT-86	TE critical for calibration)  ID #  GB37480704 US37292783 SN: 5058 (20k) SN: 5058 (20k) SN: 5047.3 / 06327 SN: 3205 SN: 601  ID #  MY41092317 100005	Cal Date (Certificate No.) 01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 27-Mar-12 (No. 217-01530) 27-Mar-12 (No. 217-01530) 28-Dec-12 (No. ES3-3205_Dec12) 27-Jun-12 (No. DAE4-601_Jun12) Check Date (in house) 18-Oct-02 (in house check Oct-11) 04-Aug-99 (in house check Oct-11)	Scheduled Calibration Oct-13 Oct-13 Apr-13 Apr-13 Dec-13 Jun-13 Scheduled Check In house check: Oct-13 In house check: Oct-13
Calibration Equipment used (M& Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A	TE critical for calibration)  ID #  GB37480704 US37292783 SN: 5058 (20k) SN: 5047.3 / 06327 SN: 3205 SN: 601  ID #  MY41092317	Cal Date (Certificate No.) 01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 27-Mar-12 (No. 217-01530) 27-Mar-12 (No. 217-01530) 28-Dec-12 (No. ES3-3205_Dec12) 27-Jun-12 (No. DAE4-601_Jun12) Check Date (in house)	Scheduled Calibration Oct-13 Oct-13 Apr-13 Apr-13 Dec-13 Jun-13 Scheduled Check In house check: Oct-13
Calibration Equipment used (M& Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A RF generator R&S SMT-86	TE critical for calibration)  ID #  GB37480704 US37292783 SN: 5058 (20k) SN: 5058 (20k) SN: 5047.3 / 06327 SN: 3205 SN: 601  ID #  MY41092317 100005	Cal Date (Certificate No.) 01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 27-Mar-12 (No. 217-01530) 27-Mar-12 (No. 217-01530) 28-Dec-12 (No. ES3-3205_Dec12) 27-Jun-12 (No. DAE4-601_Jun12) Check Date (in house) 18-Oct-02 (in house check Oct-11) 04-Aug-99 (in house check Oct-11)	Scheduled Calibration Oct-13 Oct-13 Apr-13 Apr-13 Dec-13 Jun-13 Scheduled Check In house check: Oct-13 In house check: Oct-13
Calibration Equipment used (M& Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A RF generator R&S SMT-86	TE critical for calibration)  ID #  GB37480704  US37292783  SN: 5058 (20k)  SN: 5047.3 / 06327  SN: 3205  SN: 601  ID #  MY41092317  100005  US37390585 S4206	Cal Date (Certificate No.)  01-Nov-12 (No. 217-01640)  01-Nov-12 (No. 217-01640)  27-Mar-12 (No. 217-01530)  28-Dec-12 (No. 283-2205_Dec12)  27-Jun-12 (No. DAE4-601_Jun12)  Check Date (in house)  18-Oct-02 (In house check Oct-11)  04-Aug-99 (in house check Oct-11)	Scheduled Calibration Oct-13 Oct-13 Apr-13 Apr-13 Dec-13 Jun-13 Scheduled Check In house check: Oct-13 In house check: Oct-13

Certificate No: D1800V2-2d007\_Mar13

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

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





S

- Schweizerischer Kalibrierdienst Service suisse d'étalonnage
- C Servizio svizzaro di taratura

Accreditation No.: SCS 108

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S Swiss Calibration Service

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#### Glossary:

TSL ConvF

N/A

tissue simulating liquid

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

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

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

#### Additional Documentation:

d) DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end
  of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed
  point exacty 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 phanlom. 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: D1800V2-2d007\_Mar13

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## **Measurement Conditions**

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

DASY Version	DASY5	V52.8.5
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1800 MHz ± 1 MHz	

## Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Heat TSL parameters	(22.0 ± 0.2) °C	39.0±6 %	1.39 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	-	

#### SAR result with Head TSL

SAR averaged over 1 cm3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.75 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	38.9 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm2 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5,12 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	20.5 W/kg ± 16.5 % (k=2)

## **Body TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) "C	51.4±6%	1.52 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

## SAR result with Body TSL

SAR averaged over 1 cm3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.69 W/kg
SAR for nomina Body TSL parameters	normalized to 1W	38.4 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.11 W/kg
SAR for nomina Body TSL parameters	normalized to 1W	20.3 W/kg ± 16.5 % (k=2)

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## Appendix

#### Antenna Parameters with Head TSL

Impedance, transformed to feed point	47.5 Ω - 7.6 jΩ	
Return Loss	- 21.8 dB	

#### Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.4 Ω - 7.1 jΩ	
Return Loss	- 21.1 dB	

## General Antenna Parameters and Design

Electrical Delay (one direction)	1.205 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. 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 scidered connections near the feedpoint may be damaged.

## Additional EUT Data

Manufactured by	SPEAG	
Manufactured on	July 23, 2001	

Certificate No: D1800V2-2d007\_Mar13

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## DASY5 Validation Report for Head TSL

Date: 19.03.2013

Test Laboratory: SFEAG, Zurich, Switzerland

## DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 2d007

Communication System: CW; Frequency: 1800 MHz

Medium parameters used: f = 1800 MHz;  $\sigma = 1.39 \text{ S/m}$ ;  $\varepsilon_r = 39$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

#### DASY52 Configuration:

- Probe: ES3DV3 SN3205; ConvF(5.04, 5.04, 5.04); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA, Serial: 1001
- DASY52 528.5(1059); SEMCAD X 14.6.8(7028)

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

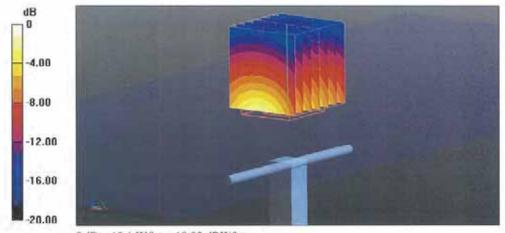
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value - 96.246 V/m; Power Drift - 0.06 dB

Peak SAR (extrapolated) = 17.7 W/kg

SAR(1 g) = 9.75 W/kg; SAR(10 g) = 5.12 W/kg

Maximum value of SAR (measured) = 12.1 W/kg



0 dB = 12.1 W/kg = 10.83 dBW/kg

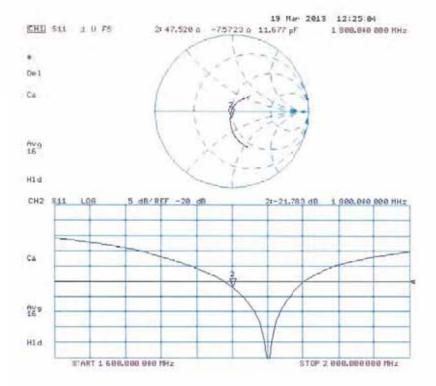
Certificate No. D1800V2-2d007\_Mar13

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## Impedance Measurement Plot for Head TSL



Certificate No: D1800V2-2d007\_Mar13

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## **DASY5 Validation Report for Body TSL**

Date: 19.03.2013

Test Laboratory; SFEAG, Zurich, Switzerland

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 2d007

Communication System: CW; Frequency: 1800 MHz

Medium parameters used: f = 1800 MHz;  $\sigma = 1.52 \text{ S/m}$ ;  $\varepsilon_r = 51.4$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

#### DASY52 Configuration:

- Probe: ES3DV3 SN3205; ConvF(4.73, 4.73, 4.73); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 528.5(1059); SEMCAD X 14.6.8(7028)

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

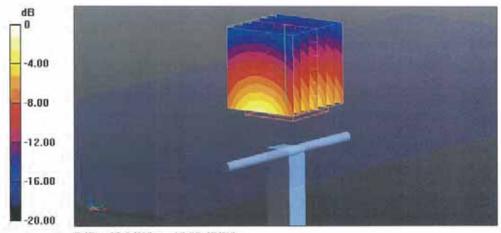
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value - 92.813 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 17.2 W/kg

SAR(1 g) = 9.69 W/kg; SAR(10 g) = 5.11 W/kg

Maximum value of SAR (measured) = 12.3 W/kg



0 dB = 12.3 W/kg = 10.90 dBW/kg

Certificate No: D1800V2-2d007\_Mar13

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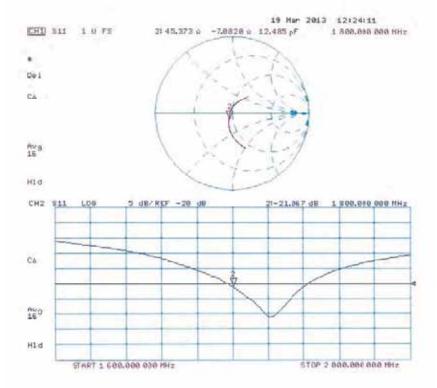
HCT CO., LTD.

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## Impedance Measurement Plot for Body TSL



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KTL (Dynstec)

Certificate No: D1900V2-5d038 Mav13

Accreditation No.: SCS 108

	CERTIFICATE		
Object	D1900V2 - SN: 5d038		
Calibration procedure(s)	QA CAL-05.v9 Calibration proce	dure for dipole validation kits at	bove 700 MHz
Calibration date:	May 29, 2013		
The measurements and the unce	ertainties with confidence p	ional standards, which realize the physical s robability are given on the following pages by ry facility: environment temperature (22 ± 3)	and are part of the certificate.
an Caronarona navo poer compr	cion in the closed laborato	ry racinty, environment temperature (22 ± 3	Cand humdity < 70%
Calibration Equipment used (M&)	TE critical for calibration)		
	The second secon	Cal Date (Certificate No.)	School ded Collegention
Primary Standards	TE critical for calibration)  ID #  GB37480704	Cal Date (Certificate No.) 01-Nov-12 (No. 217-01640)	Scheduled Calibration
Primary Standards Power meter EPM-442A	ID#	Cal Date (Certificate No.) 01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640)	Oct-13
Primary Standards Power meter EPM-442A Power sensor HP 8481A	ID # GB37480704	01-Nov-12 (No. 217-01640)	
Primary Standards Power moter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator	ID # GB37480704 US37292783	01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640)	Oct-13 Oct-13
Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuaror Type-N mismatch combination	ID # GB37480704 US37292783 SN: 5058 (20k)	01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 04-Apr-13 (No. 217-01736)	Oct-13 Oct-13 Apr-14
Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Roference Probe ES3DV3	ID # GB37480704 US37292783 SN: 5058 (20k) SN: 5047.3 / 06327	01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01739)	Oct-13 Oct-13 Apr-14 Apr-14
Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Roference Probe ES3DV3 DAE4	ID # GB37480704 US37292783 SN: 5058 (20k) SN: 5047.3 / 06327 SN: 3205	01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01739) 28-Dec-12 (No. ES3-3206_Doc12)	Oct-13 Oct-13 Apr-14 Apr-14 Dec-13
Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuaror Type-N mismatch combination Reference Probe E53DV3 DAE4 Secondary Standards	ID # GB37480704 US37292783 SN: 5058 (20k) SN: 5047.3 / 06327 SN: 3205 SN: 601	01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01739) 28-Dec-12 (No. ES3-3205_Doc12) 25-Apr-13 (No. DAE4-601_Apr13)	Oct-13 Oct-13 Apr-14 Apr-14 Dec-13 Apr-14
Primary Standards Power meter EPM-442A Power sensor HP 8481A Feterance 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A	ID # GB37480704 US37292783 SN: 5058 (20k) SN: 5047.3 / 06327 SN: 3205 SN: 601	01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01739) 28-Dec-12 (No. ES3-3205_Doc12) 25-Apr-13 (No. DAE4-601_Apr13) Check Date (in house)	Cct-13 Oct-13 Apr-14 Apr-14 Dec-13 Apr-14 Scheduled Check
Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A RF generator R&S SMT-66	ID # GB37480704 US37292783 SN: 5058 (20k) SN: 5047.3 / 06327 SN: 3205 SN: 601	01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01739) 28-Dec-12 (No. ES3-3205_Doc12) 25-Apr-13 (No. DAE4-601_Apr13) Check Date (in house) 18-Oct-02 (in house check Oct-11)	Oct-13 Oct-13 Apr-14 Apr-14 Dec-13 Apr-14 Scheduled Check In house check; Oct-13
Calibration Equipment used (M& Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuaror Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A RF generator R&S SMT-68 Notwork Analyzor HP 8753E	ID # GB37480704 US37292783 SN: 5058 (20k) SN: 5047.3 / 06327 SN: 3205 SN: 601 ID # MY41092317 100005	01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01739) 28-Dec-12 (No. ES3-3205_Doc12) 25-Apr-13 (No. DAE4-601_Apr13) Check Date (in house) 18-Oct-02 (in house check Oct-11) 04-Aug-99 (in house check Oct-11)	Oct-13 Oct-13 Apr-14 Apr-14 Dec-13 Apr-14 Scheduled Check In house check; Oct-13 In house check; Oct-13
Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuaror Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A RF generator R&S SMT-08 Notwork Analyzer HP 8753E	ID # GB37480704 U\$37292783 SN: 5058 (20k) SN: 5047.3 / 06327 SN: 3205 SN: 601 ID # MY41092317 100005 U\$37390585 \$4206	01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01739) 28-Dec-12 (No. ES3-3236_Doc12) 25-Apr-13 (No. DAE4-601_Apr-13) Check Date (in house) 18-Oct-02 (in house check Oct-11) 04-Aug-99 (in house check Oct-11) 18-Oct-01 (in house check Oct-12)	Oct-13 Oct-13 Apr-14 Apr-14 Doc-13 Apr-14 Scheduled Chack In house check; Oct-13 In house check; Oct-13
Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuaror Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A RF generator R&S SMT-08 Notwork Analyzer HP 8753E	ID # GB37480704 US37292783 SN: 5058 (20k) SN: 5047.3 / 06327 SN: 3205 SN: 601 ID # MY41092317 100005 US37390585 S4206 Name	01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01739) 28-Dec-12 (No. ES3-3226_Doc12) 25-Apr-13 (No. DAE4-601_Apr-13) Check Date (in house) 18-Oct-02 (in house check Oct-11) 04-Aug-99 (in house check Oct-11) 18-Oct-01 (in house check Oct-12) Function	Oct-13 Oct-13 Apr-14 Apr-14 Dec-13 Apr-14 Scheduled Check In house check; Oct-13 In house check; Oct-13
Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuaor Type-N mismatch combination Reference Probe ES3DV3 DAE4 Secondary Standards Power sensor HP 8481A RF generator R&S SMT-66	ID # GB37480704 US37292783 SN: 5058 (20k) SN: 5047.3 / 06327 SN: 3205 SN: 601 ID # MY41092317 100005 US37390585 S4206 Name	01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01739) 28-Dec-12 (No. ES3-3226_Doc12) 25-Apr-13 (No. DAE4-601_Apr-13) Check Date (in house) 18-Oct-02 (in house check Oct-11) 04-Aug-99 (in house check Oct-11) 18-Oct-01 (in house check Oct-12) Function	Oct-13 Oct-13 Apr-14 Apr-14 Dec-13 Apr-14 Scheduled Check In house check; Oct-13 In house check; Oct-13

Certificate No: D1900V2-5d038\_May13

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S Swiss Calibration Service

Accreditation No.: SCS 108

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

#### Glossary:

TSL tissu

tissue simulating liquid

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

## Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

#### Additional Documentation:

d) DASY4/5 System Handbook

## Methods Applied and Interpretation of Parameters:

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

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: D1900V2-5d038\_May13

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## **Measurement Conditions**

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

DASY Version	DASY5	V52.8.6
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

## Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.3 ± 5 %	1.35 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

## SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.1 W/kg
SAR for nomina Head TSL parameters	normalized to 1W	41.1 W/kg ± 17.0 % (k=2)

SAR averaged ever 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.29 W/kg
SAR for nomina Head TSL parameters	normalized to 1W	21.4 W/kg ± 16.5 % (k=2)

# Body TSL parameters The following parameters

The following parameters and calculations were applied

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.6 ± 6 %	1.49 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

## SAR result with Body TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.2 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	41.3 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5,47 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	22.1 W/kg ± 16.5 % (k=2)

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#### Appendix

## Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.1 Ω + 6.7 jΩ	
Return Loss	- 23.3 dB	

## Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.9 Ω + 7.0 jΩ
Return Loss	- 22.5 dB

## General Antenna Parameters and Design

	1777
Electrical Delay (one direction)	1.197 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. 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	July 04, 2003

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## **DASY5 Validation Report for Head TSL**

Date: 29.05.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 · SN: 5d038

Communication System: UID 0 - CW ; Frequency: 1900 MHz

Medium parameters used: f = 1900 MHz;  $\sigma = 1.35 \text{ S/m}$ ;  $\epsilon_r = 39.3$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Fat Section

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

#### DASY52 Configuration:

- Probe: ES3DV3 SN3205; ConvF(4.98, 4.98, 4.98); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- · Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 528.6(1115); SEMCAD X 14.6.9(7117)

# 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 = 97.243 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 18.1 W/kg

SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.29 W/kgMaximum value of SAR (measured) = 12.3 W/kg



0 dB = 12.3 W/kg = 10.90 dBW/kg

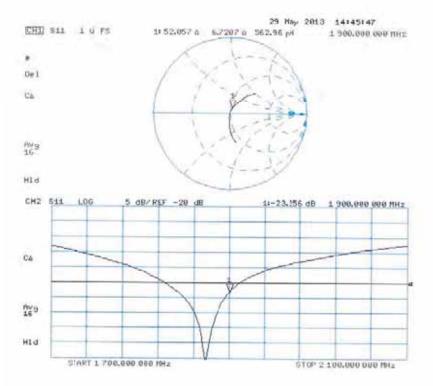
Certificate No: D1900V2-5d038\_May13

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# Impedance Measurement Plot for Head TSL



Certificate No: D1900V250038\_May13

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# DASY5 Validation Report for Body TSL

Date: 29,05,2013

Test Laboratory: SPEAG, Zurich, Switzerland

## DUT: Dipole 1900 MHz; Type; D1900V2; Serial: D1900V2 - SN: 5d038

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: f = 1900 MHz;  $\sigma = 1.49$  S/m;  $\epsilon_r = 53.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Fat Section

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

## DASY52 Configuration:

- Probe: ES3DV3 SN3205; ConvF(4.6, 4.6, 4.6); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117).

# 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 = 97.243 V/m; Power Drift - 0.02 dB

Peak SAR (extrapolated) = 17.4 W/kg

SAR(1 g) = 10.2 W/kg; SAR(10 g) = 5.47 W/kg

Maximum value of SAR (measured) = 12.9 W/kg



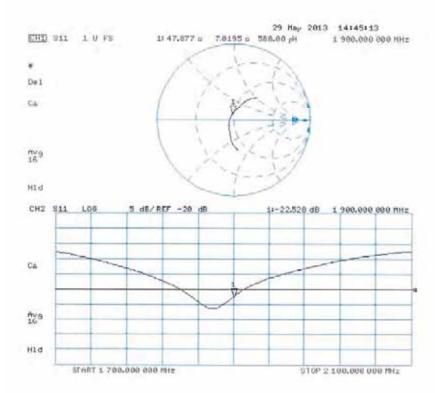
0 dB = 12.9 W/kg = 11.11 dBW/kg

Certificate No: D1900V2-5d038\_May13

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# Impedance Measurement Plot for Body TSL



Certificate No: D1900V2-5d038\_May13

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





S Schweizerischer Kallbrierdienst
C Service suisse d'étalonnage
Servizio svizzero di tarasura
S Swiss Calibration Service

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

Client HCT (Dymstec)

Accreditation No.: SCS 108

Certificate No: D2450V2-743 Aug12

Calibration procedure(a)  OA CAL-05.v6 Calibration procedure for dipole validation kits above 700-MHz  Calibration procedure for dipole validation kits above 700-MHz  Calibration cartificate documents the traceability to national standards, which residue the physical units of nestautements (31). The movementals and the uncertainties with confidence probability are given on the following pages and are part of the certificate. Not calibrations have been conducted in the closed laboratory facility-environment temperature (22 ± 0)°C and lumidity < 70%.  Calibrations Fryulpment used (MATE critical for calibration)  Primary Standards  ID # Cal Date (Certificate No.) Scheduled Calibration  Primary Standards  Oct-12  Cal Date (Certificate No.) Scheduled Calibration  Primary Standards  Oct-12  Oc		ERTIFICATE		
Calibration procedure for dipole validation kits above 700 MHz  Calibration date:  August 23, 2012  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. We calibrations have been conducted in the closed laboratory facility:environment temperature (22 ± 3)°C and lumidity < 70%.  Calibration Equipment used (MATE critical for calibration)  Primary Standards    D #   Cal Dite (Certificate No.)   Scheduled Calibration    Primary Standards   D #   Cal Dite (Certificate No.)   Scheduled Calibration    Prover sensor HP 8481A   G937480°04   05-Oc-11 (No. 217-01451)   Oci-12    Prover sensor HP 8481A   US37292183   US-Oc-11 (No. 217-01530)   Apr-13    Primary Standards   SN: 5047 2 / 06327   27-Min-12 (No. 217-01533)   Apr-13    Primary Standards   SN: 5047 2 / 06327   27-Min-12 (No. 217-01533)   Apr-13    Primary Standards   SN: 5047 2 / 06327   27-Min-12 (No. 217-01533)   Apr-13    Primary Standards   SN: 5047 2 / 06327   27-Min-12 (No. 217-01533)   Apr-13    Primary Standards   SN: 5047 2 / 06327   27-Min-12 (No. 217-01533)   Apr-13    Primary Standards   SN: 5047 2 / 06327   27-Min-12 (No. 217-01533)   Apr-13    Primary Standards   SN: 5047 2 / 06327   27-Min-12 (No. 217-01533)   Apr-13    Primary Standards   SN: 5047 2 / 06327   27-Min-12 (No. 217-01533)   Apr-13    Primary Standards   SN: 5047 2 / 06327   27-Min-12 (No. 217-01533)   Apr-13    Primary Standards   SN: 5047 2 / 06327   27-Min-12 (No. 217-01533)   Apr-13    Primary Standards   SN: 5047 2 / 06327   27-Min-12 (No. 217-01533)   Apr-13    Primary Standards   SN: 5047 2 / 06327   27-Min-12 (No. 217-01533)   Apr-13    Primary Standards   SN: 5047 2 / 06327   27-Min-12 (No. 217-01533)   Apr-13    Primary Standards   SN: 5047 2 / 06327   27-Min-12 (No. 217-01533)   Apr-13    Primary Standards   SN: 5047 2 / 06327   27-Min-12 (No. 217-01533)   Apr-13	Object	D2450V2 - SN: 7	43	
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.  No calibrations have been conducted in the closed laboratory facility:environment temperature (22 ± 3)°C and humidity < 70%.  Calibration Equipment used (MATE critical for calibration)  Primary Standards    D #   Cal Dite (Certificate No.)   Scheduled Calibration  Power mater EPM-442A   G837480/04   05-0c+11 (No. 217-01451)   Oc+12 (No. 217-01451)   Oct-12 (No. 217-01530)   Oct-12 (No. 217-01530)   Oct-13 (No. 217-01530)   Oct-14 (No. 217-01530)   O	Telibration procedure(s)	- Total Co. 100 Co. 10	dure fcr dipole validation kits abo	ove 700 MHz
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.  No calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and lumidity < 70%.  Calibration Equipment used (MATE critical for calibration)  Primary Standards  ID # Cali Date (Certificate No.) Scheduled Calibration  Primary Standards  Oct. 12  Power sensor HP 8481A  US37292783  US3	Salidization clate:	August 23, 2012		
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.  No calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and lumidity < 70%.  Calibration Equipment used (MATE critical for calibration)  Primary Standards  ID # Cali Date (Certificate No.) Scheduled Calibration  Primary Standards  Oct. 12  Power sensor HP 8481A  US37292783  US3				
Calibration Equipment used (MATE critical for calibration)  Primary Standards ID # Cali Date (Certificate No.) Scheduled Calibration  Primary Standards ID # Cali Date (Certificate No.) Scheduled Calibration  Oct. 12  Oct. 12  Oct. 12  Oct. 12  Reference 20 dB Attenutor SN: 5058 (20k) 27-Mer. 12 (No. 217-01451) Oct. 12  Reference 20 dB Attenutor SN: 5058 (20k) 27-Mer. 12 (No. 217-01530) Apr. 13  Reference Probe ES3DV3 SN: 3265 30-Dec. 11 (No. ES3-3205_Dec. 11) Dec. 12  AAE4 SN: 601 27-Jur. 12 (No. DAE4-601_Jun. 12) Jun. 13  Secondary Standards ID # Check Date (in house) Scheduled Check  Prover sensor HP 8481 A MY41092317 18-Oct. 02 (in nouse check Oct. 11) In house check Oct. 13  Reference R&S SMT-06 100005 04-Aug-99 (in house check Oct. 11) In house check Oct. 13  Network Analyzer HP 8753E US37390385 S4206 16-Oct. 01 (in house check Oct. 11)  Name Function Signature				
Primary Standards ID # Call Ditle (Certificate No.) Scheduled Calibration Power master EPM-442A GB37480704 05-Oc-11 (No. 217-01451) Oct-12 Power sensor HP 848TA U537292783 05-Oc-11 (No. 217-01451) Oct-12 Reference 20 db Attenuator SN: 508120N) 27-Mer-12 (No. 217-01530) Apr-13 Type-N mismatich combination SN: 5047.2 / 05327 27-Mer-12 (No. 217-01533) Apr-13 Reference Probe E53DV3 SN: 3025 30-De-11 (No. E83-3205, Dec11) Dec-12 SN: 601 27-Jur-12 (No. DAE4-601 Jun12) Jun-13 Secondary Standards ID # Check Date (in house) Scheduled Check Power sensor HP 8481A MY41092317 18-Oc-02 (in house check Oct-11) In house check: Oct-13 Reference R&S SMT-06 100005 04-Aug-99 (in house check Oct-11) In house check: Oct-13 Network Analyzer HP 9753E U537390385 S4206 18-Oc-01 (in house check Oct-11)  Namer Function Signature	All calibrations have been conduc	cted in the closed laborator	ry facility: environment temperature (22 ± 3)*	C and lumidity < 70%.
Constraint	Calibration Expulpment used (MAT	TE critical for calibration)		
Dec   Power surrect   PM-442A   GB37480704   OS-Oc-11 (No. 217-01451)   Oct-12	Primary Standards	in #	Call Date (Cartificate No.)	Scheduled Calibration
Devil 2   Devil 3   Devil 3   Devil 4   Devil 4   Devil 4   Devil 5   Devil 5   Devil 5   Devil 6   Devil 6   Devil 6   Devil 6   Devil 7   Devi		G837480704	The state of the s	Oct.12
SN: 5047.2 / 06327   27-Mrt-12 (No. 217-01533)   Apr-13     Interpret Probe ES3DV3   SN: 3205   30-Dec-11 (No. E83-3205_Dec11)   Dec-12     Interpret Standards   ID #   Check Date (in house)   Saheduled Check     Check Date (in house)   Saheduled Check     Check Date (in house)   Saheduled Check     Check Date (in house check Oct-11)   In house check Oct-13     If generator R&S SMT-05   100005   04-Aup-99 (in house check Oct-11)   In house check Oct-12     Name   Function   Signature				
### Service Probe ### SSDV3   SN: 3208   30-Dec-11 (No. E83-3208_Dec11)   Dec-12	OWN SHIREOF HP 8481A	US37292783	05-Oc-11 (No. 217-01451)	
AEE SN: 601 27-Jul-12 (No. DAE4-601 Jun12) Jun-13  econdary Standards ID # Check Date (in house) Scheduled Check ower sensor HP 8481A MY41092317 18-Oc-02 (in house check Oct-11) In house check: Oct-13  Figurerator R&S SMT-06 100005 04-Aug-99 (in house check Oct-11) In house check: Oct-13  letwork Analyzer HP 8759E US37390885 S4206 18-Oc-01 (in house check Oct-11) In house check: Oct-12  Name: Function Signature				Oct-12
econdary Standards ID # Check Date (in house) Scheduled Check  Ower sensor HP 8481A MY41092317 18-Oc-02 (in house check Oct-11) In house check: Oct-13  Fignerator R&S SMT-05 100005 04-Aup-99 (in house check Oct-11) In house check: Oct-13  etwork: Arrafyzer HP 9753E US37390585 S4206 18-Oc-01 (in house check Oct-11) In house check: Oct-12  Name Function Signature	eference 20 dB Attenuator	SN: 5058 (20k)	27-Ma-12 (No. 217-01530)	Oct-12 Apr-13
New	reference 20 dB Attenuator type-N miamatch combination	SN: 5058 (20k) SN: 5047.2 / 06327	27-Ma-12 (No. 217-01530) 27-Ma-12 (No. 217-01533)	Oct-12 Apr-13 Apr-13
## SP SMT-06 100005 04-Aug-99 (in house check Oct-11) In house check Oct-13 In house check Oct-12 In house check Oct-12    Name   Fundion   Signature   Signature	reference 20 dB Attenuator ype-N miamatch combination leference Probe E53DV3	SN: 5058 (20k) SN: 5047.2 / 05327 SN: 3205	27-Ms-12 (No. 217-01530) 27-Ms-12 (No. 217-01533) 30-Dus-11 (No. E83-3205_0ec11)	Oct-12 Apr-13 Apr-13 Dec-12
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Name Function Signature	teleance 20 dB Attenualor ype-N miamaich combination teleannoe Proba ES3DV3 NAE4 secondary Standards	SN: 5058 (20k) SN: 5047.2 / 06327 SN: 3205 SN: 601	27-Me-12 (No. 217-01530) 27-Me-12 (No. 217-01533) 30-De-11 (No. E83-3205_0ec11) 27-Jur-12 (No. DAE4-601_Jun12) Check Date (in house)	Oct-12 Apr-13 Apr-13 Dec-12 Jun-13 Scheduled Check In house check: Oct 13
	teference 20 dB Attenuator ype-N mismatch combination leference Probe E53DV3 AAE4 secondary Standards Power sensor HP 8481A	SN: 5058 (204) SN: 5047 2 / 06327 SN: 3205 SN: 601 ID # MY41092317	27-Me-12 (No. 217-01530) 27-Me-12 (No. 217-01533) 30-Duc-11 (No. E83-3205 Dec11) 27-Jur-12 (No. DAE4-601 Jun12) Check Date (In house) 18-Oc-02 (In house check Oct-11)	Oct-12 Apr-13 Apr-13 Dec-12 Jun-13 Scheduled Check In house check: Oct-13 In house check: Oct-13
	televence 20 dB Attenuator ype-N miamaich combination televence Probe ESSDV3 DAE4 Secondary Standards Power sensor HP 8481A 3F generator R&S SMT-05	SN: 5058 (204) SN: 5047 2 / 06327 SN: 3205 SN: 601 ID # MY41092317 100005	27-Ms-12 (No. 217-01530) 27-Mr-12 (No. 217-01533) 30-Duc-11 (No. ES3-3205_Dec11) 27-Jur-12 (No. DAE4-601_Jun12) Check Date (in house) 18-Oc-02 (in house check Oct-11) 04-Aup-99 (in house check Oct-11)	Oct-12 Apr-13 Apr-13 Dec-12 Jun-13 Scheduled Check In house check: Oct-13 In house check: Oct-13
Approved by: Kailla Pokovic Technical Manager	Reference 20 dB Attenuator Type-N mismusich combination Reference Probe ESSDV3 DAE4 Recondary Standards Power sensor HP 8481A RE generator R&S SMT-05	SN: 5058 (2004) SN: 5047 2 / 06327 SN: 3205 SN: 601 ID # MY41092317 100005 US37290585 S4206	27-Me-12 (No. 217-01530) 27-Me-12 (No. 217-01533) 30-De-11 (No. ES3-3205_Dec11) 27-Jur-12 (No. DAE4-601_Jun12) Check Date (in house) 18-Oc-02 (in house check Oct-11) 04-Aug-99 (in house check Oct-11) 18-Oc-01 (in house check Oct-11)	Oct-12 Apr-13 Apr-13 Dec-12 Jun-13 Scheduled Check In house check: Oct-13 In house check: Oct-13 In house check: Oct-13
Approved by: Kalija Pokovic Technical Manager	televence 20 dD Attenuator ype-N mismatch combination beference Probe ESSDV3 NAE4 Secondary Standards Power sensor HP 8481A RF generator R&S SMT-05 Network Analyzer HP 9753E	SN: 5058 (2004) SN: 5047 2 / 06327 SN: 3205 SN: 601  ID #  MY41092317 100005 US37290385 S4206  Name	27-Me-12 (No. 217-01530) 27-Me-12 (No. 217-01533) 30-Die-11 (No. E83-3205_Diec11) 27-Jur-12 (No. DAE4-601_Jun12)  Check Date (in house) 18-Oc-02 (in house check Oct-11) 04-Aug-99 (in house check Oct-11) 18-Oc-01 (in house check Oct-11)	Oct-12 Apr-13 Apr-13 Dec-12 Jun-13 Scheduled Check In house check: Oct-13 In house check: Oct-13 In house check: Oct-12
	Reference 20 dD Attenuator Type-N mismatch combination Reference Probe ESSDV3 DAE4 Secondary Standards Power sensor HP 8481A RF generator R&S SMT-05 Network Analyzer HP 9753E	SN: 5058 (2004) SN: 5047 2 / 06327 SN: 3205 SN: 601  ID #  MY41092317 100005 US37290385 S4206  Name	27-Me-12 (No. 217-01530) 27-Me-12 (No. 217-01533) 30-Die-11 (No. E83-3205_Diec11) 27-Jur-12 (No. DAE4-601_Jun12)  Check Date (in house) 18-Oc-02 (in house check Oct-11) 04-Aug-99 (in house check Oct-11) 18-Oc-01 (in house check Oct-11)	Oct-12 Apr-13 Apr-13 Dec-12 Jun-13 Scheduled Check In house check: Oct-13 In house check: Oct-13 In house check: Oct-12
Insued: August 23, 2012	Reference 20 dB Attenuator Type-N milamatich combination Reference Probe E53DV3 DAE4 Secondary Standards Power sensor HP 8481A RF generator R&S SMT-05 Network Analyzer HP 8753E Calibrated by:	SN: 5058 (204) SN: 5047 2 / 06327 SN: 3205 SN: 601 ID # MY41092317 100005 US37390585 S4206 Name iaras El-Naruq	27-Me-12 (No. 217-01530) 27-Me-12 (No. 217-01533) 30-Due-11 (No. ES3-3205_Dec11) 27-Jur-12 (No. DAE4-601_Jun12) Check Date (in house) 18-Oc-02 (in house check Oct-11) 04-Aug-99 (in house check Oct-11) 18-Oc-01 (in house check Oct-11) Function Laboratory Technician	Oct-12 Apr-13 Apr-13 Dec-12 Jun-13 Scheduled Check In house check: Oct-13 In house check: Oct-13 In house check: Oct-12

Certificate No: D2450V2-743\_Aug12

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





S Schweizerischer Kalibrierdsunst C Service sulsse d'étalennage Servizie svizzere di taratura S Swiss Calibration Service

Accreditation No.: SCS 108

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

#### Glossary:

TSL tissue simulating liquid

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

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

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- EC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

#### Additional Documentation:

c) 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 criented 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: D2450V2-743\_Aug12

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HCTA1307FS07 FCC ID: V65C6522 Date of Issue: Jul. 12, 2013 Report No.:

#### Measurement Conditions

DASY Version	DASY5	V52.8.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phanton	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx. dy. dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

## Head TSL parameters

he following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.2 ± 6 %	1.81 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		***

## SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	52.7 mW /g ± 17.0 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.18 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	24.7 mW /g ± 16.5 % (k=2)

Body TSL parameters .
The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.3±6%	1.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

## SAR result with Body TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.0 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	51.2 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.10 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	24.2 mW / g ± 16.5 % (k=2)

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## Appendix

#### Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.0 Ω + 4.7 JΩ
Return Loss	- 24.6 d8

#### Antenna Parameters with Body TSL

Impedance, transformed to feed pont	50.9 Ω + 6.5 jΩ
Return Loss	- 23.7 dB

## General Antenna Parameters and Design

Electrical Delay (one direction)	1.158 ns	
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After long term use with 100W radiated power, only a slightwarming of the dipole near the feedpoint can be measured.

The dpole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. 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 expessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

## Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 01, 2003

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#### DASY5 Validation Report for Head TSL

Date: 23.08.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 743

Communication System: CW; Frequency: 2450 MHz

Medium parameters used: f = 2450 MHz;  $\sigma = 1.81 \text{ nho/m}$ ;  $\epsilon_c = 39.2$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

#### DASY52 Configuration:

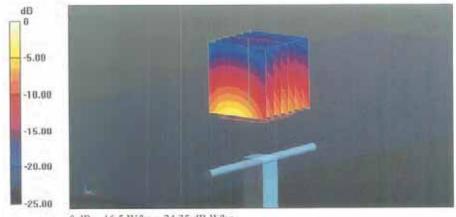
- Probe: ES3DV3 SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 30.12.2011.
- · Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: Q0000P50AA; Serial: 1001
- DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

## 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 = 98.554 V/m; Power Drift = 0.01 dB Peak SAR (extrapolated) = 26.584 mW/g

SAR(1 g) = 13.2 mW/g; SAR(10 g) = 6.18 mW/g.

Maximum value of SAR (measured) = 16.5 W/kg



0 dB = 16.5 W/kg = 24.35 dB W/kg

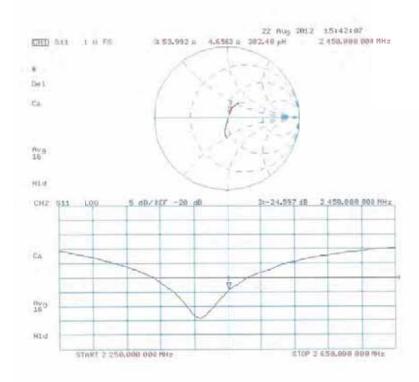
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# Impedance Measurement Plot for Head TSL



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#### DASY5 Validation Report for Body TSL

Date: 22.08.2012

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Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 743

Communication System; CW; Frequency: 2450 MHz

Medium parameters used: f = 2450 MHz;  $\sigma = 1.99$  nho/m;  $v_r = 51.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

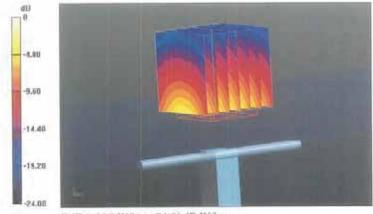
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

#### DASY52 Configuration:

- Probe: ES3DV3 SN3205; ConvF(4.26, 4.26, 4.26); Calibrated: 30.12.2011;
- · Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.2(969); SEMCAD X 14.6.6((824)

# 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 = 95.699 V/m; Power Drift = 0.01 dB Peak SAR (extrapolated) = 26.489 mW/g SAR(1 g) = 13 mW/g; SAR(10 g) = 6.1 mW/g Maximum value of SAR (measured) = 16.9 W/kg



0 dB = 16.9 W/kg = 24.56 dB W/kg

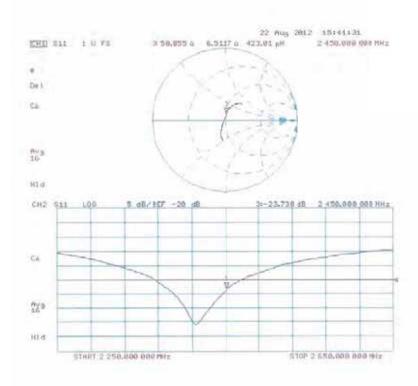
Certificate No: D2450V2-743\_Aug12

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## Impedance Measurement Plot for Body TSL



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