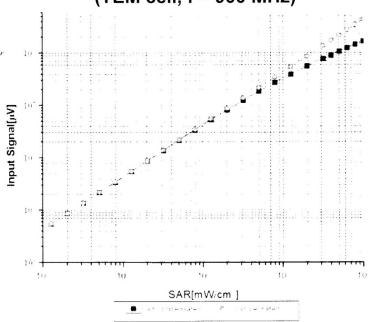


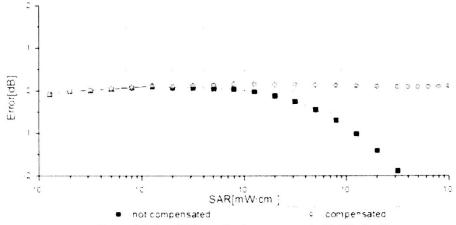
Report NO.: TS201410402001 Page 56 / 82



Add: No.52 Huayuanbei Road, Haidian District, Beijing, 100191. China Tel: =86-10-62304633-2079 Fax: +86-10-62304633-2504 Http://www.emcite.com

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





Uncertainty of Linearity Assessment: ±0.9% (k=2)

Certificate No: J13-2-2186 Page 9 of 11

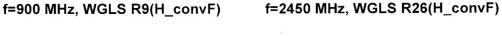


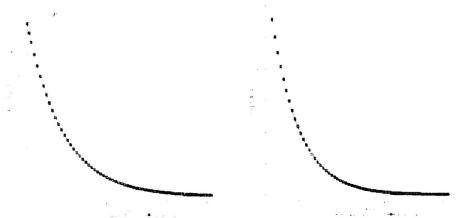
Report NO.: TS201410402001 Page 57 / 82



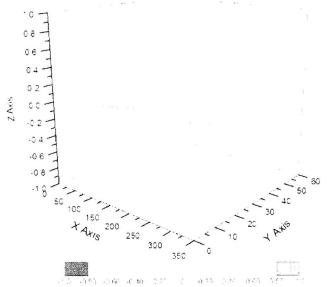
Add: No.52 Huayuanbei Road. Haidian District. Beijing. 100191. China Tel: +86-10-62304633-2079 Fax: -86-10-62304633-2504 Http://www.emcite.com

### **Conversion Factor Assessment**





## **Deviation from Isotropy in Liquid**



Uncertainty of Spherical Isotropy Assessment: ±2.8% (K=2)

Certificate No: J13-2-2186 Page 10 of 11

Report NO.: TS201410402001 Page 58 / 82



E-mail: Info@emcite.com

Add: No.52 Huayuanbei Road. Haidian District. Beijing. 100191. China Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504 Http://www.emcite.com

### DASY - Parameters of Probe: ES3DV3 - SN: 3028

### **Other Probe Parameters**

Sensor Arrángement	Triangular
Connector Angle (°)	54.7
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	10mm
Tip Diameter	4mm
Probe Tip to Sensor X Calibration Point	2mm
Probe Tip to Sensor Y Calibration Point	2mm
Probe Tip to Sensor Z Calibration Point	2mm
Recommended Measurement Distance from Surface	3mm

Certificate No: J13-2-2186



Report NO.: TS201410402001 Page 59 / 82



#### Acceptable Conditions for SAR Measurements Using Probes and Dipoles Calibrated under the SPEAG-TMC Dual-Logo Calibration Program to Support FCC Equipment Certification

The acceptable conditions for SAR measurements using probes, dipoles and DAEs calibrated by TMC (*Telecommunication Metrology Center of MITT in Beijing, China*), under the Dual-Logo Calibration Certificate program and quality assurance (QA) protocols established between SPEAG (*Schmid & Partner Engineering AG, Switzerland*) and TMC, to support FCC (*U.S. Federal Communications Commission*) equipment certification are defined and described in the following.

- 1) The agreement established between SPEAG and TMC is only applicable to calibration services performed by TMC where its clients (companies and divisions of such companies) are headquartered in the Greater China Region, including Taiwan and Hong Kong. This agreement is subject to renewal at the end of each calendar year between SPEAG and TMC. TMC shall inform the FCC of any changes or early termination to the agreement.
- 2) Only a subset of the calibration services specified in the SPEAG-TMC agreement, while it remains valid, are applicable to SAR measurements performed using such equipment for supporting FCC equipment certification. These are identified in the following.
  - a) Calibration of dosimetric (SAR) probes EX3DVx, ET3DVx and ES3DVx.
    - i) Free-space E-field and H-field probes, including those used for HAC (hearing aid compatibility) evaluation, temperature probes, other probes or equipment not identified in this document, when calibrated by TMC, are excluded and cannot be used for measurements to support FCC equipment certification.
    - ii) Signal specific and bundled probe calibrations based on PMR (probe modulation response) characteristics are handled according to the requirements of KDB 865664; that is, "Until standardized procedures are available to make such determination, the applicability of a signal specific probe calibration for testing specific wireless modes and technologies is determined on a case-by-case basis through KDB inquiries, including SAR system verification requirements."
  - b) Calibration of SAR system validation dipoles, excluding HAC dipoles.
  - c) Calibration of data acquisition electronics DAE3Vx, DAE4Vx and DAEasvVx.
  - d) For FCC equipment certification purposes, the frequency range of SAR probe and dipole calibrations is limited to 700 MHz - 6 GHz and provided it is supported by the equipment identified in the TMC QA protocol (a separate attachment to this document).
  - The identical system and equipment setup, measurement configurations, hardware, evaluation algorithms, calibration and QA protocols, including the format of calibration certificates and reports used by SPEAG shall be applied by TMC
  - f) The calibrated items are only applicable to SPEAG DASY 4 and DASY 5 or higher version systems.



Report NO.: TS201410402001 Page 60 / 82



- 3) The SPEAG-TMC agreement includes specific protocols identified in the following to ensure the quality of calibration services provided by TMC under this SPEAG-TMC Dual-Logo calibration agreement are equivalent to the calibration services provided by SPEAG. TMC shall, upon request, provide copies of documentation to the FCC to substantiate program implementation.
  - a) The Inter-laboratory Calibration Evaluation (ILCE) stated in the TMC QA protocol shall be performed between SPEAG and TMC at least once every 12 months. The ILCE acceptance criteria defined in the TMC QA protocol shall be satisfied for the TMC, SPEAG and FCC agreements to remain valid.
  - b) Check of Calibration Certificate (CCC) shall be performed by SPEAG for all calibrations performed by TMC. Written confirmation from SPEAG is required for TMC to issue calibration certificates under the SPEAG-TMC Dual-Logo calibration program. Quarterly reports for all calibrations performed by TMC under the program are also issued by SPEAG.
  - c) The calibration equipment and measurement system used by TMC shall be verified before each calibration service according to the specific reference SAR probes, dipoles, and DAE calibrated by SPEAG. The results shall be reproducible and within the defined acceptance criteria specified in the TMC QA protocol before each actual calibration can commence. TMC shall maintain records of the measurement and calibration system verification results for all calibrations.
  - d) Quality Check of Calibration (QCC) certificates shall be performed by SPEAG at least once every 12 months. SPEAG shall visit TMC facilities to verify the laboratory, equipment, applied procedures and plausibility of randomly selected certificates.
- 4) A copy of this document, to be updated annually, shall be provided to TMC clients that accept calibration services according to the SPEAG-TMC Dual-Logo calibration program, which should be presented to a TCB (*Telecommunication Certification Body*), to facilitate FCC equipment approval.
- 5) TMC shall address any questions raised by its clients or TCBs relating to the SPEAG-TMC Dual-Logo calibration program and inform the FCC and SPEAG of any critical issues.

Change Note: Revised on June 26 to clarify the applicability of PMR and Bundled probe calibrations according to the requirements of KDB 865664.



Report NO.: TS201410402001 Page 61 / 82

### **Appendix D. DAE Calibration Data:**





CALIBRATION LABORATORY

Add: No.52 Huayuanbei Road. Haidian District. Beijing. 100191. China Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504 Http://www.emcite.com

Client:

Sunway

Certificate No: J13-2-2187

### CALIBRATION CERTIFICATE

Object

DAE4 - SN: 689

Calibration Procedure(s)

TMC-OS-E-01-198

Calibration Procedure for the Data Acquisition Electronics

(DAEx)

Calibration date:

July 20, 2013

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID#	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Documenting Process Calibrator 753	1971018	01-July-13 (TMC, No:JW13-049)	July-14

Name

Function

Calibrated by:

Zhao Jing

SAR Test Engineer

Reviewed by:

Qi Dianyuan

SAR Project Leader

Approved by:

Xiao Li

Deputy Director of the laboratory

Issued: August 5, 2013

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

Certificate No: JZ13-2-2187

Page 1 of 3



Report NO.: TS201410402001 Page 62 / 82







Add: No.52 Huayuanbei Road. Haidian District. Beijing. 100191, China Tel: -86-10-62304633-2079 Fax: -86-10-62304633-2504 E-mail: Http://www.emcite.com

Glossary:

DAE data acquisition electronics

Connector angle information used in DASY system to align probe sensor X

to the robot coordinate system.

### Methods Applied and Interpretation of Parameters:

 DC Voltage Measurement: Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.

- Connector angle: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The report provide only calibration results for DAE, it does not contain other performance test results.

Certificate No: JZ13-2-2187

Page 2 of 3



Report NO.: TS201410402001 Page 63 / 82



е

Add: No.52 Huayuanbei Road. Haidian District. Beijing. 100191. China Tcl: +86-10-62304633-2079 Fax: -86-10-62304633-2504 Http://www.emcitc.com

### DC Voltage Measurement

A/D - Converter Resolution nominal

full range = -100...+300 mV full range = -1......+3mV 6.1μV , 61nV , High Range: 1LSB = Low Range: 1LSB = DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.270 ± 0.15% (k=2)	404.187 ± 0.15% (k=2)	404.856 ± 0.15% (k=2)
Low Range	3.95764 ± 0.7% (k=2)	3.97509 ± 0.7% (k=2)	3.99031 ± 0.7% (k=2)

### **Connector Angle**

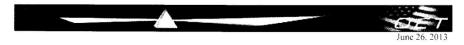
Connector Angle to be used in DASY system	87.5° ± 1 °

Certificate No: JZ13-2-2187

Page 3 of 3



Report NO.: TS201410402001 Page 64 / 82



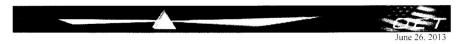
#### Acceptable Conditions for SAR Measurements Using Probes and Dipoles Calibrated under the SPEAG-TMC Dual-Logo Calibration Program to Support FCC Equipment Certification

The acceptable conditions for SAR measurements using probes, dipoles and DAEs calibrated by TMC (*Telecommunication Metrology Center of MITT in Beijing, China*), under the Dual-Logo Calibration Certificate program and quality assurance (QA) protocols established between SPEAG (*Schmid & Partner Engineering AG, Switzerland*) and TMC, to support FCC (*U.S. Federal Communications Commission*) equipment certification are defined and described in the following.

- 1) The agreement established between SPEAG and TMC is only applicable to calibration services performed by TMC where its clients (companies and divisions of such companies) are headquartered in the Greater China Region, including Taiwan and Hong Kong. This agreement is subject to renewal at the end of each calendar year between SPEAG and TMC. TMC shall inform the FCC of any changes or early termination to the agreement.
- 2) Only a subset of the calibration services specified in the SPEAG-TMC agreement, while it remains valid, are applicable to SAR measurements performed using such equipment for supporting FCC equipment certification. These are identified in the following.
  - a) Calibration of dosimetric (SAR) probes EX3DVx, ET3DVx and ES3DVx.
    - i) Free-space E-field and H-field probes, including those used for HAC (hearing aid compatibility) evaluation, temperature probes, other probes or equipment not identified in this document, when calibrated by TMC, are excluded and cannot be used for measurements to support FCC equipment certification.
    - ii) Signal specific and bundled probe calibrations based on PMR (probe modulation response) characteristics are handled according to the requirements of KDB 865664; that is, "Until standardized procedures are available to make such determination, the applicability of a signal specific probe calibration for testing specific wireless modes and technologies is determined on a case-by-case basis through KDB inquiries, including SAR system verification requirements."
  - b) Calibration of SAR system validation dipoles, excluding HAC dipoles.
  - c) Calibration of data acquisition electronics DAE3Vx, DAE4Vx and DAEasyVx.
  - d) For FCC equipment certification purposes, the frequency range of SAR probe and dipole calibrations is limited to 700 MHz - 6 GHz and provided it is supported by the equipment identified in the TMC QA protocol (a separate attachment to this document).
  - e) The identical system and equipment setup, measurement configurations, hardware, evaluation algorithms, calibration and QA protocols, including the format of calibration certificates and reports used by SPEAG shall be applied by TMC.
  - f) The calibrated items are only applicable to SPEAG DASY 4 and DASY 5 or higher version systems.



Report NO.: TS201410402001 Page 65 / 82



- 3) The SPEAG-TMC agreement includes specific protocols identified in the following to ensure the quality of calibration services provided by TMC under this SPEAG-TMC Dual-Logo calibration agreement are equivalent to the calibration services provided by SPEAG. TMC shall, upon request, provide copies of documentation to the FCC to substantiate program implementation.
  - a) The Inter-laboratory Calibration Evaluation (ILCE) stated in the TMC QA protocol shall be performed between SPEAG and TMC at least once every 12 months. The ILCE acceptance criteria defined in the TMC QA protocol shall be satisfied for the TMC. SPEAG and FCC agreements to remain valid.
  - b) Check of Calibration Certificate (CCC) shall be performed by SPEAG for all calibrations performed by TMC. Written confirmation from SPEAG is required for TMC to issue calibration certificates under the SPEAG-TMC Dual-Logo calibration program. Quarterly reports for all calibrations performed by TMC under the program are also issued by SPEAG.
  - c) The calibration equipment and measurement system used by TMC shall be verified before each calibration service according to the specific reference SAR probes, dipoles, and DAE calibrated by SPEAG. The results shall be reproducible and within the defined acceptance criteria specified in the TMC QA protocol before each actual calibration can commence. TMC shall maintain records of the measurement and calibration system verification results for all calibrations.
  - d) Quality Check of Calibration (QCC) certificates shall be performed by SPEAG at least once every 12 months. SPEAG shall visit TMC facilities to verify the laboratory, equipment, applied procedures and plausibility of randomly selected certificates.
- 4) A copy of this document, to be updated annually, shall be provided to TMC clients that accept calibration services according to the SPEAG-TMC Dual-Logo calibration program, which should be presented to a TCB (*Telecommunication Certification Body*), to facilitate FCC equipment approval.
- 5) TMC shall address any questions raised by its clients or TCBs relating to the SPEAG-TMC Dual-Logo calibration program and inform the FCC and SPEAG of any critical issues.

Change Note: Revised on June 26 to clarify the applicability of PMR and Bundled probe calibrations according to the requirements of KDB 865664.



Report NO.: TS201410402001 Page 66 / 82

### **Appendix E. Dipole Calibration Data:**

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





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

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

Certificate No: D835V2-4d154\_Jun13

Accreditation No.: SCS 108

ALIBRATION C			
bject	D835V2 - SN: 4d1	54	
talibration procedure(4)	QA CAL-05.v9 Calibration proced	ure for dipole validation kits above	ve 700 MHz
Calibration date:	June 06, 2013		
The measurements and the unce	rtainties with confidence pro	mal standards, which realize the physical unit obability are given on the following pages and y tacility: environment temperature (22 ± 3)°C	
Calibration Equipment used (M&	TE critical for calibration)		Scheduled Calibration
Calibration Equipment used (M& Primary Standards	TE crisical for calibration)	Cal Date (Certificate No.) 01-Nov-12 (No. 217-01640)	Scheduled Calibration Oct-13
Calibration Equipment used (M& Primary Standards Power meter EPM-442A	TE crisical for calibration)  ID #  GB57480704	Cal Date (Certificate No.)	Scheduled Calibration Oct-13 Oct-13
Calibration Equipment used (M& Primary Standards Power meter EPM-442A Power sonsor HP 8481A	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 Apr-14
Calibration Equipment used (M& Primary Standards. Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator	ID # GB37480794 US37292783 SN: 3058 (20k)	Cal Date (Certificate No.) 01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01736)	Scheduled Calibration Oct-13 Oct-13 Apr-14 Apr-14
Calibration Equipment used (M& Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator Type-N mismatch combination	ID # GB37480704 US37292783	Cal Date (Certificate No.) 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-Ooc-12 (No. ESS-3005_Dec12)	Scheduled Calibration Oct-13 Oct-13 Apr-14 Apr-14 Dec-13
Calibration Equipment used (M& Primary Standards Power meter EPM-442A Power sensor HP 8481A Reference 20 dB Attenuator	ID # GB37480704 US37292783 SN: 3058 (20k) SN: 5047.3 / 06327	Cal Date (Certificate No.) 01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01736)	Scheduled Calibration Oct-13 Oct-13 Apr-14 Apr-14
Calibration Equipment used (M& Primary Standards Power meter EPM-442A Power sonsor HP B481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ESSDV3 DAE4	TE crisical for calibration)  ID #  OB37480704  US37292783  SN: 5058 (20k)  SN: 5047.3 / 06327  SN: 3205  SN: 601	Cal Date (Certificate No.) 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) 25-Apr-13 (No. DAE4-601_Apr13)	Scheduled Calibration Oct-13 Oct-13 Apr-14 Apr-14 Dec-13
Calibration Equipment used (M& Primary Standards Power meter EPM-442A Power sensor HP B481A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES3DV3 OAE4 Secondary Standards	TE crisical for calibration)  ID #  GB37480704  US37292783  SN: 3058 (20k)  SN: 5047.3 / 06327  SN: 3255  SN: 601	Cat Date (Certificate No.) 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) 25-Apr-13 (No. DAE4-601_Apr13) Check Date (in house)	Scheduled Calibration 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 8-81A Reference 20 dB Attenuator Type-N mismatch combination Reference Probe ES30V3 OAE4 Secondary Standards Power sensor HP 8481A	TE criscal for calibration)  ID #  GBS7480704  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) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01736) 26-Oec-12 (No. ES3-3205_Dec12) 25-Apr-13 (No. DAE4-601_Apr13) Check Date (in house)	Scheduled Calibration Oct-13 Oct-13 Apr-14 Apr-14 Dec-13 Apr-14 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	TE crisical for calibration)  ID #  GB37480704  US37292783  SN: 3058 (20k)  SN: 5047.3 / 06327  SN: 3255  SN: 601	Cat Date (Certificate No.) 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) 25-Apr-13 (No. DAE4-601_Apr13) Check Date (in house)	Scheduled Calibration 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 mater 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-06	TE criscal for calibration)  ID #  OB37480704  US37292783  SN: 5068 (20k)  SN: 5068 (20k)  SN: 5067 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) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01736) 26-Dec-12 (No. ESS-3205, Dec12) 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) 18-Oct-01 (in house check Oct-12)	Scheduled Calibration Oct-13 Oct-13 Apr-14 Apr-14 Dec-13 Apr-14 Scheduled Check In house check: Oct-13 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 ES30V3 OAE4 Secondary Standards Power sensor HP 8481A RF generator R&S SMT-06	TE criscal for calibration)  ID #  OB37480704  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) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01736) 26-Dec-12 (No. ES3-3205_Dec12) 25-Apr-13 (No. DAE4-601_Apr13) Check Date (in house) 18-Oct-07 (in house check Oct-11) 04-Aug-99 (in house check Oct-11) 18-Oct-01 (in house check Oct-12)	Scheduled Calibration Oct-13 Oct-13 Apr-14 Apr-14 Dec-13 Apr-14 Scheduled Check In house check: Oct-13 In house check: Oct-13
Calibration Equipment used (M& Primary Standards Power mater 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-06	TE criscal for calibration)  ID #  OB37480704  US37292783  SN: 5068 (20k)  SN: 5068 (20k)  SN: 5067 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) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01736) 26-Dec-12 (No. ESS-3205, Dec12) 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) 18-Oct-01 (in house check Oct-12)	Scheduled Calibration Oct-13 Oct-13 Apr-14 Apr-14 Dec-13 Apr-14 Scheduled Check In house check: Oct-13 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-06 Network Analyzer HP 8753E	TE criscal for calibration)  ID #  OB37480704  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) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01736) 26-Dec-12 (No. ES3-3205_Dec12) 25-Apr-13 (No. DAE4-601_Apr13) Check Date (in house) 18-Oct-07 (in house check Oct-11) 04-Aug-99 (in house check Oct-11) 18-Oct-01 (in house check Oct-12)	Scheduled Calibration Oct-13 Oct-13 Apr-14 Apr-14 Dec-13 Apr-14 Scheduled Check In house check: Oct-13 In house check: Oct-13 In house check: Oct-13

Certificate No: D835V2-4d154\_Jun13

Page 1 of 8



Report NO.: TS201410402001 Page 67 / 82

Calibration Laboratory of Schmid & Partner Engineering AG 43, 0004 Zurieh, Switzerland





Schweizerischer Kalibrierdie S Service suisse c'étalonnage C 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 signatories to the EA Multilateral Agreement for the recognition of calibration certificates

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)\*,

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 T5L: 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
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phartom. 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 narmalized: SAR as measured, normalized to an input power of 1 W at the antenna
- 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: D835V2-4d154\_Jun13

Page 2 of 8



Report NO.: TS201410402001 Page 68 / 82

### Measurement Conditions

on, as far as not given on page 1.

ASY system configuration, as lar as not	DASY5	V52.8.3
DASY Version		
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
	835 MHz ± 1 MHz	
Frequency	100 mm m	

Head TSL parameters

ne following parameters and calculations were appri	Temperature	Permittivity	Conductivity
The second secon	22.3 °C	41.5	0.90 mho/m
Nominal Head TSL parameters	(22.0 ± 0.2) °C	40.4 ± 6 %	0.94 mho/m ± 6 %
Measured Head TSL parameters	< 0.5 °C	****	
Used TOI temperature change during test	-0.0		

### SAR result with Head TSL

SAR averaged over 1 cm2 (1 g) of Head TSL	Condition		
	250 mW input power	2,47 W/sg	
SAR measured	walked to 1W	9.51 W/kg ± 17.0 % (k=2)	
SAR for nominal Head TS_ parameters	normalized to 1W	410.111.2	

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
	250 mW nput power	1.59 W.kg
SAR measured		6.17 W/kg ± 16.5 % (k=2)
SAR for nominal Head TSL parameters	normalized to 1W	o.n mag =

Body TSL parameters

ne following parameters and calculations were appro-	Temperature	Permittivity	Conductivity
	22.0 °C	55.2	0.97 mho/m
Nominal Body TSL parameters	(22.0 ± 0.2) °C	54.5 ±6 %	1.00 mho/m ± 6 %
Measured Body TSL parameters			
Body TSI temperature change during test	< 0.5 °C		

### SAR result with Body TSL

1 to 1 at Party TSI	Condition	
SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	250 mW input power	2.44 W/kg
SAR measured	normalized to 1W	9.51 W/kg ± 17.0 % (k=2)
SAR for nominal Body TSL parameters	normalized to 144	

10 ml of Body TSL	condition	
SAR averaged over 10 cm3 (10 g) of Body TSL	250 mW Input power	1.59 W/kg
SAR measured		6.23 W/kg ±16.5 % (k=2)
SAR for nominal Body TSL parameters	normalized to 1W	100

Certificate No: D835V2-4d154\_Jun13

Page 3 of 8



Report NO.: TS201410402001 Page 69 / 82

#### Appendix

### Antenna Parameters with Head TSL

to tood point	52.4 Ω - 2.8 μΩ
Impedance, transformed to feed point	- 28.8 dB
Return Loss	

## Antenna Parameters with Body TSL

to seed to lead point	48.2 Ω - 4.5 jΩ
Impedance, transformed to leed point	- 26.0 dB
Return Loss	- 20.0 00

## General Antenna Parameters and Design

The state of the s	1,432 ns
Electrical Delay (one direction)	
Flooring and it	

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 arterina is therefore chort-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

	SPEAG
Manufactured by	December 28, 2012
Manufactured on	December 20, 20 to

Certificate No: D835V2-4d154\_Jun13 Page 4 of 8



Report NO.: TS201410402001 Page 70 / 82

## DASY5 Validation Report for Head TSL

Date: 06.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d154

Communication System: UID 0 - CW; Frequency: 335 MHz Medium parameters used: f = 835 MHz;  $\sigma = 0.94$  S/m;  $\epsilon_r = 40.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Fat Section

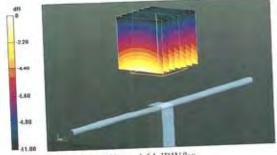
Measurement Standard: DASY5 (IEFF/IEC/ANSI C63.19-2007)

#### DASY52 Configuration:

- Probe: ES3DV3 SN3205; ConvF(6.05, 6.05, 6.05); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sr601; Calibrated: 25.04.2013
- 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 = 57.316 V/m; Power Drift = -0.00 dB Peak SAR (extrapolated) = 3.76 W/kg SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.59 W/kgMaximum value of SAR (measured) = 2.91 W/kg

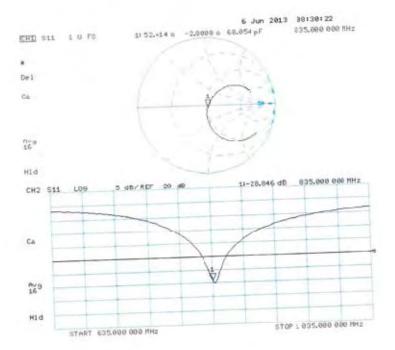


0 dB = 2.91 W/kg = 4.64 dBW/kg



Report NO.: TS201410402001 Page 71 / 82

## Impedance Measurement Plot for Head TSL



Certificate No: D835V2-4d154\_Jun13

Page 6 of 8



Report NO.: TS201410402001 Page 72 / 82

## DASY5 Validation Report for Body TSL

Date: 05.06.2013

Test Laboratory: SPEAG, Zurizh, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d154

Communication System: UID 0 - CW; Frequency: \$35 MHz.

Medium parameters used: f = 835 MHz;  $\sigma = 1$  S/m;  $\epsilon_r = 54.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

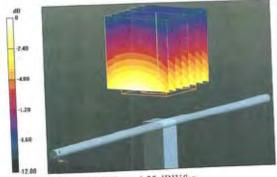
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

#### DASY52 Configuration:

- Probe: ES3DV3 SN3205; ConvF(6.04, 6.04, 6.04); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAF4 Sr601; Calibrated: 25.04.2013
- 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 = 55.428 V/m; Power Drift = -0.00 dB Peak SAR (extrapolated) = 3.58 W/kg SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.59 W/kg Maximum value of SAR (measured) = 2.85 W/kg

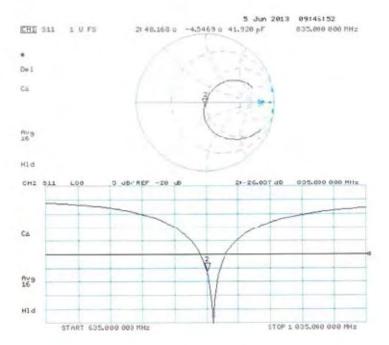


0 dE = 2.85 W/kg = 4.55 dBW/kg



Report NO.: TS201410402001 Page 73 / 82

### Impedance Measurement Plot for Body TSL



Page 6 of 8



Report NO.: TS201410402001 Page 74 / 82

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





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

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

Accreditation No.: SCS 108

Contillanto No. D1900V2-5d142 Jun 12

Object	D1900V2 - SN: 5	d142	
Calibration procedure(s)	QA CAL-05.v9 Calibration proce	dure for dipole validation kits abo	ove 700 MHz
Calibration date:	June 10, 2013		
		onal standards, which realize the physical un robability are given on the following pages an	
		by facility: environment temperature (22 $\pm$ 3)%	C and humidity < 70%,
Calibration Equipment used (M&			
Calibration Equipment used (M&	TE critical for calibration)	ry facility: environment temperature (22 ± 3)*(  Cal Date (Certificate No.)  01-Nov-12 (No. 217-01640)	C and humidity < 70%.  Scheduled Calibration Oct-13
alibration Equipment used (M& imary Standards ower meter EPM-442A	TE critical for calibration)	Cal Date (Certificate No.)	Scheduled Calibration
alibration Equipment used (M& rimary Standards ower meter EPM-442A ower sensor HP 8481A	TE critical for calibration)	Cal Date (Certificate No.) 01-Nov-12 (No. 217-01640)	Scheduled Calibration Oct-13
rimary Standards ower meter EPM-442A ower sensor HP 8481A eference 20 dB Attenuator	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
rimary Standards ower meter EPM-442A ower sensor HP 8481A leference 20 dB Attenuator ype-N mismatch combination leference Probe ES3DV3	ID # GB37480704 US37292783 SN: 5058 (20k)	Cal Date (Certificate No.) 01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 04-Apr-13 (No. 217-01736)	Scheduled Calibration Oct-13 Oct-13 Apr-14
trimary Standards lower meter EPM-442A lower sensor HP 8481A telerence 20 dB Attenuator type-N mismatch combination telerence Probe ES3DV3	ID # GB37480704 US37292783 SN: 5058 (20k) SN: 5047.3 / 06327	Cal Date (Certificate No.) 01-Nov-12 (No. 217-01640) 01-Nov-12 (No. 217-01640) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01739)	Scheduled Calibration Oct-13 Oct-13 Apr-14 Apr-14
Calibration Equipment used (M&Calibration Equipment used (M&Calibration Section 1)  Fower meter EPM-442A  Fower sensor HP 8481A  Reference 20 dB Attenuator  ype-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) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01739) 28-Dec-12 (No. ESS-3205_Dec12) 25-Apr-13 (No. DAE4-601_Apr13)	Scheduled Calibration Oct-13 Oct-13 Apr-14 Apr-14 Dec-13 Apr-14
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	ID # GB37480704 US37292783 SN: 5058 (20k) SN: 5047.3 / 06327 SN: 3205 SN: 601	Cal Date (Certificate No.) 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_Dec12) 25-Apr-13 (No. DAE4-601_Apr13) Check Date (in house)	Scheduled Calibration Oct-13 Oct-13 Apr-14 Apr-14 Dec-13 Apr-14 Scheduled Check
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 NAE4 Secondary Standards Power sensor HP 8481A	ID # GB37480704 US37292783 SN: 5058 (20k) SN: 5047.3 / 06327 SN: 3205 SN: 601	Cal Date (Certificate No.) 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. ESS-3205_Dec12) 25-Apr-13 (No. DAE4-601_Apr13)	Scheduled Calibration Oct-13 Oct-13 Apr-14 Apr-14 Dec-13 Apr-14
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-06	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) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01739) 28-Dec-12 (No. ES3-3205_Dec12) 25-Apr-13 (No. DAE4-601_Apr13) Check Date (in house)	Scheduled Calibration Oct-13 Oct-13 Apr-14 Apr-14 Dec-13 Apr-14 Scheduled Check In house check: Oct-13
Calibration Equipment used (M&	ID #  GB37480704 US37292783 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)  04-Apr-13 (No. 217-01736)  04-Apr-13 (No. 217-01739)  28-Dec-12 (No. ES3-3205_Dec12)  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)	Scheduled Calibration 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 Attenuator Type-N mismatch combination Reference Probe ES3DV3 IAE4 Recondary Standards Power sensor HP 8481A RF generator R&S SMT-06 Retwork Analyzer HP 8753E	ID #  GB37480704 US37292783 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)  04-Apr-13 (No. 217-01736)  04-Apr-13 (No. 217-01739)  28-Dec-12 (No. ES3-3205_Dec12)  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)	Scheduled Calibration 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 Attenuator Type-N mismatch combination Reference Probe ES3DV3 DAE4 Recondary Standards Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer HP 8753E	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) 04-Apr-13 (No. 217-01736) 04-Apr-13 (No. 217-01739) 28-Dec-12 (No. ES3-3205_Dec12) 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) 18-Oct-01 (in house check Oct-12)	Scheduled Calibration Oct-13 Oct-13 Apr-14 Apr-14 Dec-13 Apr-14 Scheduled Check In house check: Oct-13 In house check: Oct-13 In house check: Oct-13
All calibrations have been conducted in the calibration Equipment used (M&Tealibration Equipm	TE critical for calibration)  ID #  GB37480704  US37292783  SN: 5058 (20k)  SN: 5047.3 / 06327  SN: 3205  SN: 601  ID #  MY41092317 100005  US37390585 S4206  Name	Cal Date (Certificate No.) 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_Dec12) 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-12) Function	Scheduled Calibration Oct-13 Oct-13 Apr-14 Apr-14 Dec-13 Apr-14 Scheduled Check In house check: Oct-13 In house check: Oct-13 In house check: Oct-13

Certificate No: D1900V2-5d142\_Jun13

Page 1 of 8



Report NO.: TS201410402001 Page 75 / 82

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





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

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
- 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: D1900V2-5d142\_Jun13

Page 2 of 8



Report NO.: TS201410402001 Page 76 / 82

### **Measurement Conditions**

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

DASY Version	DASY5	V52.8.7
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 ± 6 %	1.34 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	9.83 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	40.2 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.18 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	21.0 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	53.7 ± 6 %	1.50 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		3

### 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	10.1 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	40.8 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	5.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.8 W/kg ± 16.5 % (k=2)



Report NO.: TS201410402001 Page 77 / 82

#### Appendix

#### Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.8 Ω + 5.8 jΩ	
Return Loss	- 24.0 dB	

#### Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.0 Ω + 6.2 jΩ	
Return Loss	- 23.6 dB	

#### General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 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	March 11, 2011

Certificate No: D1900V2-5d142\_Jun13



Report NO.: TS201410402001 Page 78 / 82

### DASY5 Validation Report for Head TSL

Date: 10.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d142

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

Medium parameters used: f = 1900 MHz;  $\sigma = 1.34 \text{ S/m}$ ;  $\varepsilon_r = 39.3$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

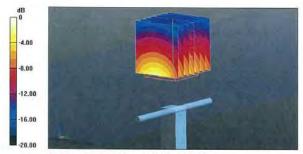
#### DASY52 Configuration:

- Probe: ES3DV3 SN3205; ConvF(4.98, 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 52.8.7(1137); SEMCAD X 14.6.10(7164)

### 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 = 95.950 V/m; Power Drift = 0.03 dB Peak SAR (extrapolated) = 17.8 W/kg SAR(1g) = 9.83 W/kg; SAR(10g) = 5.18 W/kg

SAR(1 g) = 9.83 W/kg; SAR(10 g) = 5.18 W/kgMaximum value of SAR (measured) = 12.3 W/kg

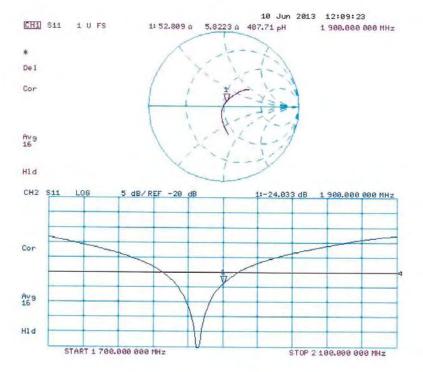


0 dB = 12.3 W/kg = 10.90 dBW/kg



Report NO.: TS201410402001 Page 79 / 82

### Impedance Measurement Plot for Head TSL





Report NO.: TS201410402001 Page 80 / 82

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

Date: 10.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d142

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

Medium parameters used: f = 1900 MHz;  $\sigma = 1.5$  S/m;  $\epsilon_r = 53.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

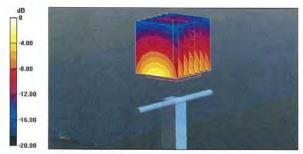
#### DASY52 Configuration:

- Probe: ES3DV3 SN3205; ConvF(4.6, 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 52.8.7(1137); SEMCAD X 14.6.10(7164)

### 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 = 95.950 V/m; Power Drift = 0.03 dB Peak SAR (extrapolated) = 17.4 W/kg SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.41 W/kg

Maximum value of SAR (measured) = 12.8 W/kg

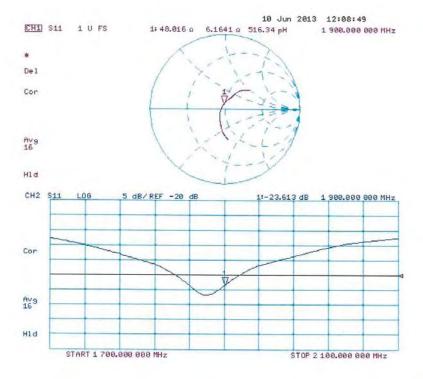


0 dB = 12.8 W/kg = 11.07 dBW/kg



Report NO.: TS201410402001 Page 81 / 82

### Impedance Measurement Plot for Body TSL





Report NO.: TS201410402001 Page 82 / 82



**China National Accreditation Service for Conformity Assessment** 

## LABORATORY ACCREDITATION CERTIFICATE

(Registration No. CNAS L6487)

Shenzhen Sunway Communication Co., Ltd. Testing Center

1/F., Building A, SDG Info Port, Kefeng Road, Hi-Tech Park,

Nanshan District, Shenzhen, Guangdong, China

is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories(CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence of testing.

The scope of accreditation is detailed in the attached appendices bearing the same registration number as above. The appendices form an integral part of this certificate.

Date of Issue: 2013-10-29

Date of Expiry: 2016-10-28

Date of Initial Accreditation: 2013-10-29

Date of Update: 2013-10-29

\*学

Signed on behalf of China National Accreditation Service for Conformity Assessment

China National Accreditation Service for Conformity Assessment (CNAS) is authorized by Certification and Accreditation Administration of the People's Republic of China (CNCA) to operate the national accreditation schemes for conformity assessment, CNAS is the signatory to International Laboratory Accreditation Cooperation Multilateral Recognition Arrangement (ILAC MRA) and Asia Pacific Laboratory Accreditation Cooperation Multilateral Recognition Arrangement (APLAC MRA).

No.CNASAL2

0008227