

# Appendix C

# **Phantom Description**

Schmid & Partner Engineering AG



Zeughausstrasse 43, 8004 Zurich, Switzerland Phone +41 44 245 9700, Fax +41 44 245 9779 info@speag.com, http://www.speag.com

#### Certificate of Conformity / First Article Inspection

| Item         | Oval Flat Phantom ELI 5.0                        |
|--------------|--|
| Type No      | QD OVA 002 A                                     |
| Series No    | 1108 and higher                                  |
| Manufacturer | Untersee Composites                              |
|              | Knebelstrasse 8, CH-8268 Mannenbach, Switzerland |

#### Tests

Complete tests were made on the prototype units QD OVA 001 A, pre-series units QD OVA 001 B as well as on some series units QD OVA 001 B. Some tests are made on all series units QD OVA 002 A.

| Test                    | Requirement   | Details   | Units tested                    |
|-------------------------|---|---|---------------------------------|
| Shape                   | Internal dimensions, depth and<br>sagging are compatible with<br>standards                | Bottom elliptical 600 x 400<br>mm, Depth 190 mm,<br>dimension compliant with [1]<br>for f > 375 MHz | Prototypes                      |
| Material thickness      | Bottom:<br>2.0mm +/- 0.2mm  | dimension compliant with<br>[3] for f > 800 MHz   | all                             |
| Material<br>parameters  | rel. permittivity 2 – 5,<br>loss tangent ≤ 0.05, at f ≤ 6<br>GHz                          | rel. permittivity 3.5 +/- 0.5<br>loss tangent ≤ 0.05  | Material<br>samples             |
| Material<br>resistivity | Compatibility with tissue<br>simulating liquids .   | Compatible with SPEAG<br>liquids. **  | Phantoms,<br>Material<br>sample |
| Sagging                 | Sagging of the flat section in<br>tolerance when filled with<br>tissue simulating liquid. | within tolerance for filling<br>height up to 155 mm   | Prototypes,<br>samples          |

Note: Compatibility restrictions apply certain liquid components mentioned in the standard, containing e.g. DGBE, DGMHE or Triton X-100. Observe technical note on material compatibility.

Standards

- OET Bulletin 65, Supplement C, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields", Edition 01-01
   IEEE 1528-2003, "Recommended Practice for Determining the Peak Spatial-Average Specific
- Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques, December 2003
- IEC 62209-1 ed1.0, "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices Human models, instrumentation, and procedures Part 1: [3] Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", 2005-02-18
- IEC 62209-2 ed1.0, "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices Human models, instrumentation, and procedures Part 2: [4] Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", 2010-03-30

#### Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of body-worn SAR measurements and system performance checks as specified in [1 – 4] and further standards

25.7.2011 Date

Signature / Stamp

peag mid & Partner-Engineering/AG gbayestrassa 43, 8004 Zulich, Shit mano ng/442 44/265/9708 #2/444 64/45 9779

Doc No 881 - QD OVA 002 A - A

Page 1 (1)

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明,此報告結果僅對測試之樣品負責,同時比樣品僅保留<sup>90</sup>天。本報告未經本公司書面許可,不可部份複製。 This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <u>www.sgs.com/terms\_and\_conditions.htm</u> and for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sqs.com/terms e-document.htm. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

> No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路 134號 SGS Taiwan Ltd.



# System Validation from Original Equipment Supplier

| regression and a local Address  | s, Switzerland   | ILAC MRA  | S Schwilzzrischer Kallbrierdienat<br>Service suisse d'étalonnage<br>Servizio relazero di taratura<br>S vias Calibration Service   |  |
|---|--|---|---|--|
| Accedited by the Swiss Acceditation<br>The Swiss Acceditation Service<br>Additional Agreement for the re-   | is one of the signatoria   | es to the EA  | ccreditation No.: SCS 0108  |  |
| Client SGS-TW (Aude   | 0)   | Certificate N   | a D2450V2-727_Apr19   |  |
| CALIBRATION C   | ERTIFICATI   | E   |   |  |
| Object  | D2450V2 - SN:7   | 27  |   |  |
| Calibration procedure(e)  | QA CAL-05.v11<br>Calibration Proce   | edure for SAR Validation Source:  | s between 0,7-3 GHz   |  |
| Calibration data:   | April 24, 2019   |   | -   |  |
| This calculation certificate docume   |  |   |   |  |
| The mean even of the second and the   | ed in the closed laboratu  | arobability are given on the following pages a<br>vy fechity: schetomonol temperature (25 a 3/  |   |  |
| The measurements and the pricert<br>All calibrations have seen conduct<br>Calibration Equipment used (M&T)  | ed in the closed laboratu  |   | C and humidity a 70%-   |  |
| The mean rements and the property<br>All calibrations have seen conduct<br>Calibration Equipment used (MST)<br>Primitry Standards   | ed in the blosed laborato<br>E critical for calibration(   | ey Nicely: eminormal tamperabael (25 a 3)*  |   |  |
| The measurements and the proven<br>All calibrations have issue conduct<br>Calibration Equipment used (M&T)<br>Primary Streetlards<br>Passe mater NRP  | ind in the closed laborato<br>E onfical for salibration(<br>  10. v  | ry Nicely: emvirormand temperature (22 a 3)*<br>Cal Date (CertPicale No.)   | C and haracely a 70%-   |  |
| The measurements and the prove<br>All calibration have seen conduct<br>Calibration Expansion used (M&T)<br>Primitry Standards<br>Power mater NRP<br>Power service NRP   | era en the closed isbowno<br>E offical for salisetion(<br>0. v<br>SN: 104778   | Py Netwity: environment temperature (25 a d)*<br>Call Date (CertPicale No.)<br>03-Apr 19 (No. 217-02802(02863)  | C and humidity + 70%.<br>Scheituleri Calibration<br>Apr-20  |  |
| The mean rements and the proof<br>All calibration have been conduct<br>Calibration Equipment used (M&T)<br>Friming Standards<br>Power mater NRP<br>Power sensor NRP (201<br>Power sensor NRP 201  | ed in the closed laboration<br>E official for salidantican(<br>10 y<br>SN: 104778<br>SN: 104244  | Py Novity: emvironment temperature (22 a d)*<br>Call Date (Certificale No.)<br>03-Apr-19 (No. 217-02802(02863)<br>03-Apr-19 (No. 217-02892)   | C and humidity + 70%.<br>Scheduleri Calibration<br>Apr-20<br>Apr-20   |  |
| The measurements and the provi<br>All calibration Inline Islam conduct<br>Calibration Equipment used (MST)<br>Primitry Standards<br>Primer service NRP<br>Power service NRP<br>Power service NRP 201<br>Primer service NRP 201<br>Primer service NRP 201<br>Primer service NRP 201<br>Primer service NRP 201  | Ind in the closed laboration<br>E onlical for calibration(<br>IO V<br>SN: 104778<br>SN: 103244<br>SN: 103245   | Py Noteity: externational temperature (25 a 3)<br>Call Date (Certificate No.)<br>03-Apr-19 (No. 217-02802(02863)<br>03-Apr-19 (No. 217-02892)<br>03-Apr-19 (No. 217-02892)  | C and humidity + 70%.<br>Scheduler Calibration<br>Apr-20<br>Apr-20<br>Apr-20  |  |
| The mean annumers and the origin<br>All calibration have seen conduct<br>Calibration Equipment used (M&T)<br>Priver mater NRP<br>Power sensor NRP 291<br>Priver sensor NRP 291<br>Priver sensor NRP 291<br>Priver sensor NRP 291<br>Reference 20 dB Attenuator<br>Type-N misensich contrarection<br>Reference Probe EXXDV4  | end in the closed isbown<br>E official for satisfication(<br>0. v<br>SN: 104778<br>SN: 103244<br>SN: 103244<br>SN: 103245<br>SN: 5054 (904)<br>SN: 5047 2 / 00027<br>SN: 5047 2 / 00027<br>SN: 7340  | Py Nexisty: exminantment temperatures (25 = 3)*<br>Call Date (Certificate No.)<br>03-Apr-19 (No. 217-02802(02993)<br>03-Apr-19 (No. 217-02992)<br>03-Apr-19 (No. 217-02953)<br>04-Apr-19 (No. 217-02954)  | C and hamidity + 70%.<br><u>Schedules</u> Calibration<br>Apr-20<br>Apr-20<br>Apr-20<br>Apr-20<br>Apr-20   |  |
| The measurements and the prices<br>All calibration Equipment used (M&T)<br>Calibration Equipment used (M&T)<br>Primitry Standards<br>Power service NRP<br>Power service NRP<br>Power service NRP-201<br>Power service NRP-201<br>Reference 20 dB Attenuator<br>Type-N mismiscic conternation<br>Reference Probe EX3DV4  | end en the closed isboards<br>E official for salidentien)<br>E N: 104778<br>SN: 104244<br>SN: 103244<br>SN: 103244<br>SN: 5064 (204)<br>SN: 5047 2 / 00027   | Cal Date (Certificate No.)<br>03-Apr-19 (No. 217-02802(02893)<br>03-Apr-19 (No. 217-02802(02893)<br>03-Apr-19 (No. 217-02802)<br>04-Apr-19 (No. 217-02804)<br>04-Apr-19 (No. 217-02804)   | C and humidity + 70%.<br><u>Scheduley Calibration</u><br>Apr-20<br>Apr-20<br>Apr-20<br>Apr-20<br>Apr-20<br>Apr-20<br>Apr-20<br>Apr-20   |  |
| The measurements and the prices<br>All calibration Equipment used (MSTE<br>Calibration Equipment used (MSTE<br>Primily Standards<br>Privat sector NRP<br>Privat sector NRP<br>Privat sector NRP 201<br>Privat Sector Sector Sector Sector<br>Privat Sector Sector Sector Sector Sector<br>Privat Sector Sector Sector Sector Sector Sector<br>Privat Sector Se   | end in the closed isbown<br>E official for satisfication(<br>0. v<br>SN: 104778<br>SN: 103244<br>SN: 103244<br>SN: 103245<br>SN: 5054 (904)<br>SN: 5047 2 / 00027<br>SN: 5047 2 / 00027<br>SN: 7340  | Cal Date (CertPicale No.)<br>Cal Date (CertPicale No.)<br>03-Apr-19 (No. 217-02802(02883)<br>03-Apr-19 (No. 217-02892)<br>03-Apr-19 (No. 217-02893)<br>04-Apr-19 (No. 217-02893)<br>04-Apr-19 (No. 217-02895)<br>31-Dec 16 (No. 2X3-7340, Dec14)  | C and humidity + 70%.<br><u>Scheitulesi Calibration</u><br>Apr-20<br>Apr-20<br>Apr-20<br>Apr-20<br>Apr-20<br>Dec-19   |  |
| The measurements and the prices<br>All calibration Equipment used (MSTC<br>Calibration Equipment used (MSTC<br>Primitry Standards<br>Power sensor NRP-201<br>Priver senso                   | ed in the closed isbands<br>E offical for salishden(<br>00 v<br>SN: 104778<br>SN: 103244<br>SN: 103246<br>SN: 5058 (204)<br>SN: 5047 2 / 06027<br>SN: 7340<br>SN: 601  | Cal Date (Certhicale No.)<br>Cal Date (Certhicale No.)<br>03-Apr-19 (No. 217-02802(02863)<br>03-Apr-19 (No. 217-02892)<br>03-Apr-19 (No. 217-02892)<br>04-Apr-19 (No. 217-02895)<br>04-Apr-19 (No. 217-02895)<br>04-Apr-19 (No. 217-02895)<br>04-Oct-18 (No. DAE4-601_Cot18)  | C and humidity + 70%.<br>Scheduler Calibration<br>Apr-20<br>Apr-20<br>Apr-20<br>Apr-20<br>Apr-20<br>Dec-19<br>Dec-19<br>Dec-19  |  |
| The measurements and the prove<br>All calibration Equipment used (MST)<br>Calibration Equipment used (MST)<br>Primiting Standards<br>Power service NRP<br>Power service NRP 201<br>Primer service Standards<br>Primer service Standards<br>Primer service Standards   | end en the closed isboards<br>E official for satisfication(<br>0.1 v<br>SN: 104778<br>SN: 1042744<br>SN: 1042445<br>SN: 1042445<br>SN: 5047 2 / 00327<br>SN: 504<br>SN: 504<br>SN: 504<br>SN: 504<br>SN: 504<br>SN: 504<br>SN: 504<br>SN: 504  | Cal Date (Certificate No.)<br>Cal Date (Certificate No.)<br>03-Apr-19 (No. 217-02802(02863)<br>03-Apr-19 (No. 217-02802(02863)<br>03-Apr-19 (No. 217-02802)<br>04-Apr-19 (No. 217-02805)<br>04-Apr-19 (No. 217-02805)<br>01-Occ 10 (No. 217-02805)<br>01-Occ 10 (No. 217-02805)<br>04-Oct-18 (No. DAE4-601_Oct18)<br>Offices Oate (in house)  | Cland Humidally + 70%.<br><u>Scheatules</u> Calibration<br>Apr-20<br>Apr-20<br>Apr-20<br>Apr-20<br>Apr-20<br>Dec-19<br>Doct-19<br>Doct-19<br>Boteck and Chaole  |  |
| The measurements and the prices<br>All calibration Equipment used (MST)<br>Calibration Equipment used (MST)<br>Privet Service NRP<br>Power service NRP<br>Power service NRP-201<br>Privet service NRP-201<br>Power service Standards<br>Power service HP SH81A<br>Power service HP SH81A  | E offical for satisficants<br>E offical for satisfication(<br>0.9<br>SN: 104778<br>SN: 104778<br>SN: 104246<br>SN: 10524<br>SN: 5058 (954)<br>SN: 5058 (954)<br>SN: 5058<br>SN: 27340<br>SN: 601<br>ID 6<br>BN: GB30512475<br>SN: U337292765<br>SN: WY41002317   | Cal Date (Certificate No.)<br>Cal Date (Certificate No.)<br>03-Apr-19 (No. 217-02802(02893)<br>03-Apr-19 (No. 217-02802(02893)<br>03-Apr-19 (No. 217-02803)<br>04-Apr-19 (No. 217-02804)<br>04-Apr-19 (No. 217-02804)<br>04-Apr-19 (No. 217-02804)<br>04-Apr-19 (No. 217-02804)<br>04-Apr-19 (No. 217-02804)<br>04-Apr-19 (No. 217-02804)<br>04-Oct-18 (No. DAE4-601 (Cot18)<br>Check Date (in house)<br>07-Oct-15 (in house Creck Feb-18)  | C and humidity + 70%.<br><u>Schedules</u> Calibration<br>Apr-20<br>Apr-20<br>Apr-20<br>Apr-20<br>Apr-20<br>Apr-20<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19   |  |
| The measurements and the prove<br>All calibrations have easer conduct<br>Calibration Equipment used (MSTI<br>Primary Standards<br>Prover sensor NRP 201<br>Prover sensor NRP 201<br>OAE4<br>Secondary Standards<br>Prover sensor NP 6481A<br>Prover sensor NP 6481A   | ed in the closed isbown<br>E offical for calibration(<br>00 v<br>SN: 104778<br>SN: 103244<br>SN: 103244<br>SN: 103245<br>SN: 5047 2/ 00227<br>SN: 7340<br>SN: 5047 2/ 00227<br>SN: 7340<br>SN: 601<br>10 4<br>BN: 63830512475<br>SN: U3372902765<br>SN: U3372902765<br>SN: U3372902765<br>SN: 100072   | Cal Date (Certificale No.)<br>Cal Date (Certificale No.)<br>03-Apr-19 (No. 217-02802(02863)<br>03-Apr-19 (No. 217-02892)<br>03-Apr-19 (No. 217-02892)<br>04-Apr-19 (No. 217-02894)<br>04-Apr-19 (No. 217-02894)<br>04-Apr-19 (No. 225-7340, Dec14)<br>04-Oct-18 (No. DAE4-601, Col18)<br>Check Date (in house)<br>07-Oct-15 (in house check Teo-18)<br>07-Oct-15 (in house check Oct-16)<br>07-Oct-15 (in house check Oct-16)   | C and humidity + 70%.<br><u>Scheduled Calibration</u><br>Apr-20<br>Apr-20<br>Apr-20<br>Apr-20<br>Dec-19<br>Def-19<br>Def-19<br>Def-19<br>Def-19<br>Def-19<br>Def-20<br>In house check: Cef-20<br>In house check: Cef-20 |  |
| The measurements and the prove<br>All calibrations have easer conduct<br>Calibration Equipment used (MSTI<br>Primary Standards<br>Prover sensor NRP 201<br>Prover sensor NRP 201<br>OAE4<br>Secondary Standards<br>Prover sensor NP 6481A<br>Prover sensor NP 6481A   | E offical for satisficants<br>E offical for satisfication(<br>0.9<br>SN: 104778<br>SN: 104778<br>SN: 104246<br>SN: 10524<br>SN: 5058 (954)<br>SN: 5058 (954)<br>SN: 5058<br>SN: 27340<br>SN: 601<br>ID 6<br>BN: GB30512475<br>SN: U337292765<br>SN: WY41002317   | Cal Date (Certificale No.)<br>Cal Date (Certificale No.)<br>03-Apr-19 (No. 217-02892)(02863)<br>03-Apr-19 (No. 217-02892)<br>03-Apr-19 (No. 217-02893)<br>04-Apr-19 (No. 217-02895)<br>04-Apr-19 (No. 217-02895)<br>04-Apr-19 (No. 217-02895)<br>04-Apr-19 (No. 217-02895)<br>04-Opr-19 (No. 217-02895)<br>04-Opr-19 (No. 217-02895)<br>04-Opr-19 (No. 217-02895)<br>04-Opr-19 (No. 223-7340, Dec14)<br>04-Oct-18 (No. DAE4-601, Col18)<br>07-Oct-15 (in house check Feb-18)<br>07-Oct-15 (in house check Oct-18)   | C and humidity + 70%.<br>Scheitulesi Calibration<br>Apr-20<br>Apr-20<br>Apr-20<br>Apr-20<br>Dec-19<br>Dcl-19<br>Dcl-19<br>Dcl-19<br>Dcl-19<br>Dcl-19<br>Dcl-20<br>In house check: Oct-20<br>In house check: Oct-20  |  |
| The mean annumers and the origin<br>All calibrations have taken conducts<br>Calibration Equipment used (M&TC<br>Privmery Steectards<br>Prover sensor NRP 201<br>Prover sensor Probe EX3DV4<br>DAE4<br>Secontary Blandards<br>Prover sensor HP 6481A<br>Prover sensor HP 6481A<br>Prover sensor HP 6481A<br>Prover sensor HP 6481A<br>Prover sensor HP 6481A   | ed in the closed isbown<br>E offical for calibration(<br>00 v<br>SN: 104778<br>SN: 103244<br>SN: 103244<br>SN: 103245<br>SN: 5047 2/ 00227<br>SN: 7340<br>SN: 5047 2/ 00227<br>SN: 7340<br>SN: 601<br>10 4<br>BN: 63830512475<br>SN: U3372902765<br>SN: U3372902765<br>SN: U3372902765<br>SN: 100072   | Cal Date (Certificale No.)<br>Cal Date (Certificale No.)<br>03-Apr-19 (No. 217-02802(02883)<br>03-Apr-19 (No. 217-02892)<br>03-Apr-19 (No. 217-02892)<br>04-Apr-19 (No. 217-02894)<br>04-Apr-19 (No. 217-02894)<br>04-Apr-19 (No. 225-7340, Dec14)<br>04-Oct-18 (No. DAE4-601, Col18)<br>Check Date (in house)<br>07-Oct-18 (in house check Teo-18)<br>07-Oct-15 (in house check Oct-16)<br>07-Oct-15 (in house check Oct-16)<br>07-Oct-15 (in house check Oct-16)  | C and humidity + 70%.<br><u>Scheinlich Galbration</u><br>Apr-20<br>Apr-20<br>Apr-20<br>Apr-20<br>Apr-20<br>Del-19<br>Del-19<br>Del-19<br>Del-19<br>Del-19<br>Del-19<br>Scheiduller Chuck<br>In house check: Del-20<br>In house check: Del-20<br>In house check: Del-18  |  |
| This mean arements and the second   | Ind in the closed isboards<br>E official for salisation(<br>0.0 //<br>SN: 104778<br>SN: 103244<br>SN: 103245<br>SN: 50472 / 00027<br>SN: 50472 / 00027<br>SN: 50472 / 00027<br>SN: 601<br>10 //<br>SN: 6830512475<br>SN: 69372/92763<br>SN: MY4102317<br>SN: 105972<br>SN: 0541080477  | Cal Date (Certificate No.)<br>Cal Date (Certificate No.)<br>03-Apr-19 (No. 217-02802(02893)<br>03-Apr-19 (No. 217-02802(02893)<br>03-Apr-19 (No. 217-02804)<br>04-Apr-19 (No. 217-02804)<br>04-Apr-19 (No. 217-02806)<br>01-Oct-19 (No. 217-02806)<br>01-Oct-19 (No. 207-7340, Dec14)<br>04-Oct-18 (In house Creck Feb-18)<br>07-Oct-15 (In house Creck Feb-18)<br>07-Oct-15 (In house Creck Feb-18)<br>07-Oct-15 (In house Creck Oct-18)<br>07-Oct-15 (In house Creck Oct-18)<br>07-Oct-15 (In house Creck Oct-18) | C and humidity + 70%.<br><u>Scheduled Calibration</u><br>Apr-20<br>Apr-20<br>Apr-20<br>Apr-20<br>Dec-19<br>Def-19<br>Def-19<br>Def-19<br>Def-19<br>Def-19<br>Def-20<br>In house check: Cef-20<br>In house check: Cef-20 |  |
| The mean annumeric and the oricent<br>All calibration Equipment used (M&TC<br>Calibration Equipment used (M&TC<br>Prominy Simutinds<br>Power assissor NRP 2291<br>Power sensor NRP 2391<br>Power sensor Sensor Sensor<br>Power sensor Poble EX3DV4<br>DAE4<br>Secondary Standards<br>Power sensor NRP 8481A<br>Power sensor Power 8481A<br>Power sensor Power 8481A<br>Power sensor Power 8481A<br>Power sensor Power 8481A<br>Power | end en the closed isboards<br>E official for salisation(<br>0.9<br>SN: 104778<br>SN: 103244<br>SN: 103244<br>SN: 103246<br>SN: 5047 2 / 00327<br>SN: 504<br>SN: 5 | Cal Date (CertPicale No.)<br>03-Apr-19 (No. 217-02802(02893)<br>03-Apr-19 (No. 217-02802(02893)<br>03-Apr-19 (No. 217-02803)<br>04-Apr-19 (No. 217-02803)<br>04-Apr-19 (No. 217-02803)<br>04-Apr-19 (No. 217-02803)<br>04-Oct-18 (No. 207-736), Dec14)<br>04-Oct-18 (No. DAE4-601 (Oct18)<br>Check Date (in house check Feb-18)<br>07-Oct-15 (in house check Cert16)<br>15-Jun-15 (in house check Oct-18)<br>21-Mar-14 (in house check Oct-18)<br>Function  | C and humidity + 70%.<br><u>Scheithileit Gallbration</u><br>Apr-20<br>Apr-20<br>Apr-20<br>Apr-20<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-20<br>In house check: Det-20<br>In house check: Det-18<br>In house check: Det-18  |  |

Certilicate No: 02450V2-727\_ Apr19

Page 7 of 6

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明,此報告結果僅對測試之樣品負責,同時此樣品僅保留90天。本報告未經本公司書面許可,不可部份複製。 This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <u>www.sgs.com/terms\_and\_conditions.htm</u> and for electronic format documents, subject to Terms and Conditions for Electronic Documents at <u>www.sgs.com/terms\_ad\_conditions.htm</u> and for electronic format documents, subject to tiss document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路 134號 SGS Taiwan Ltd.

f (886-2) 2298-0488



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



Sonweigerlecher Kallboardenm S Service subsect/étalonnage C Servizio evizzero di tentiore s

Swise Calibration Service

Acconditation No.: SCS 0108

According by the Sweet Accordition Service (SAS). The Swim Accreditation Service is one of the eignatories to the EA. Multilateral Agreement for the recognition of calibration certificates

#### Glossary:

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

## Additional Documentation:

e) DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point No uncortainty 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: D2450V2-727 Aprt9

Page 2 of 6

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明,此報告結果僅對測試之樣品負責,同時比樣品僅保留<sup>90</sup>天。本報告未經本公司書面許可,不可部份複製。 This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <u>www.sgs.com/terms\_and\_conditions.htm</u> and for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sqs.com/terms e-document.htm. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

> No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路 134號 SGS Taiwan Ltd.

t (886-2) 2299-3279 台灣檢驗科技股份有限公司

f (886-2) 2298-0488



#### Measurement Conditions

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

| DASY Version                 | DASYS                   | V52.10.2    |
|------------------------------|-------------------------|-------------|
| Extrapolation                | Advanced Extrapolation  |             |
| Phantom                      | Moduliar Flat Physitian |             |
| Distance Dipole Center - TSL | 10 mm                   | with Spacer |
| Zoom Scan Resolution         | dz, dy, dz = 5 mm       |             |
| Frequency                    | 8450 MHz ± 1. MHz       |             |

# Head TSL parameters

The following parameters and calculations were spoliad

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 38.2         | 1.80 mbo/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 378±8%       | 1.87 mho/m ± 6 % |
| Head TSL temperature change during test | <0.5 "G         | _            |                  |

## SAR result with Head TSL

| SAR averaged over 1 cm <sup>2</sup> (1 g) of Head TSL                   | Condition          |                          |
|---|--------------------|--------------------------|
| SAR meesured  | 250 mW input power | 13.6 W/kg                |
| SAR for normal Head TSL perameters                                      | Wt al besilamon    | 53.0 W/kg ± 17.0 % (k=2) |
|   |                    |                          |
| SAR averaged over 10 cm <sup>2</sup> (10 g) of Head TSL                 | condition          |                          |
| SAR averaged over 10 cm <sup>2</sup> (10 g) of Head TSL<br>SAR measured | 250 mW input power | 6.28 W/kg                |

Certificate No: D2450V2-727\_Apr19

Page 3 of 6

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明,此報告結果僅對測試之樣品負責,同時此樣品僅保留90天。本報告未經本公司書面許可,不可部份複製。 This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <u>www.sgs.com/terms\_and\_conditions.htm</u> and for electronic format documents, subject to Terms and Conditions for Electronic Documents at <u>www.sgs.com/terms\_ad\_conditions.htm</u> and for electronic format therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路 134 號 SGS Taiwan Ltd.

台灣檢驗科技股份有限公司 t (886-2) 2299-3279 f (886-2) 2298-0488

www.tw.sas.com



# Appendix (Additional assessments outside the scope of SCS 0108)

## Antenna Parameters with Head TSL

| Impedance, transformed to leed point | 55.8 Q+2.8 jQ |  |
|--------------------------------------|---------------|--|
| Return Loss                          | - 24.2 dB     |  |

# General Antenna Parameters and Design

| Electrical Delay (one direction) | 1.149 ns |
|----------------------------------|----------|
|----------------------------------|----------|

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

The dipole is made of standard seminigid coaxeal cable. The center conductor of the feeding line is directly connected to the second aim of the dipole. The antenna is therefore short-circuitud for DC-signals. On some of the dipoles, small end cape 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 effected 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 soldiered connections near the leedpoint may be damaged.

#### Additional EUT Data

| Manufectured by | SPEAG |
|-----------------|-------|
|                 |       |

Certificate No: D2450V2-727\_Apr19

Page 4 of 6

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明,此報告結果僅對測試之樣品負責,同時此樣品僅保留90天。本報告未經本公司書面許可,不可部份複製。 This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <u>www.sgs.com/terms\_and\_conditions.htm</u> and for electronic format documents, subject to Terms and Conditions for Electronic Documents at <u>www.sgs.com/terms\_ad\_conditions.htm</u> and for electronic format documents, subject to tiss document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路 134號 SGS Taiwan Ltd.

t (886-2) 2299-3279 台灣檢驗科技股份有限公司

f (886-2) 2298-0488

www.tw.sas.com



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

Date: 24.04.2019

Test Laboratory: SPEAG, Zurich, Switzerland

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

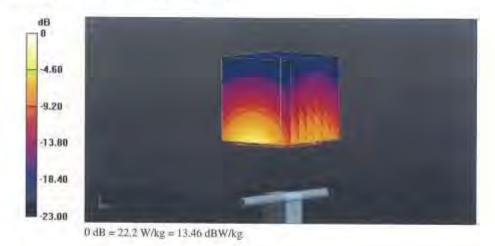
Communication System: UID 0 - CW; Frequency; 2450 MHz Medium parameters used; f = 2450 MHz;  $\sigma = 1.87$  S/m;  $\epsilon_r = 37.8$ ;  $\rho = 1000$  kg/m<sup>3</sup> Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(7.96, 7.96, 7.96) @ 2450 MHz; Calibrated: 31.12.2018
- . Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018 .
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 116.3 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 26.9 W/kg SAR(1 g) = 13.6 W/kg; SAR(10 g) = 6.28 W/kg Maximum value of SAR (measured) = 22.2 W/kg



Certificate No: D2450V2-727\_Apr19

Page 5 of 6

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明,此報告結果僅對測試之樣品負責,同時比樣品僅保留<sup>90</sup>天。本報告未經本公司書面許可,不可部份複製。 This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <u>www.sgs.com/terms\_and\_conditions.htm</u> and for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sqs.com/terms e-document.htm. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路134號 SGS Taiwan Ltd.

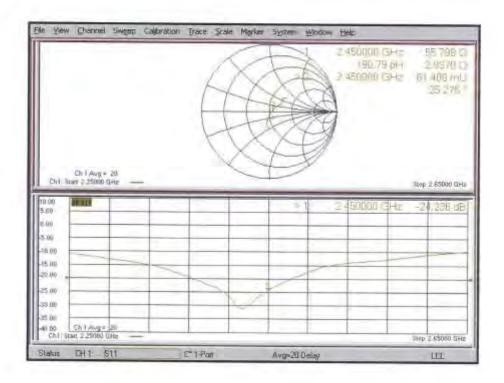
t (886-2) 2299-3279 台灣檢驗科技股份有限公司

f (886-2) 2298-0488



Report No. : EN/2019/70012 Rev: 01 Page: 7 of 16

## Impedance Measurement Plot for Head TSL



Certificate No: D2450V2-727 Apr19

Page 6 of 6

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明,此報告結果僅對測試之樣品負責,同時此樣品僅保留90天。本報告未經本公司書面許可,不可部份複製。 This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <u>www.sgs.com/terms\_and\_conditions.htm</u> and for electronic format documents, subject to Terms and Conditions for Electronic Documents at <u>www.sgs.com/terms\_ad\_conditions.htm</u> and for electronic format therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路 134號 SGS Taiwan Ltd.

t (886-2) 2299-3279 台灣檢驗科技股份有限公司

f (886-2) 2298-0488



| Engineering AG<br>sughausstrassa 43, 8004 Zurich,  | of<br>Switzeriand  |  | Carulan milinan di dialamman   |
|--|--|--|--|
| corection by the Swiss Accreditation<br>the Swise Accreditation Service I<br>fulfiliateral Agreement for the rec   | s one of the signatorie  | to the EA  | ccreditation No.: SCS 0108   |
| lient SGS-TW (Auden  | *  |  | o: D5GHzV2-1023_Jan19  |
| CALIBRATION CI   | ERTIFICATE   | 5  |  |
| Dbjødt i   | D5GHzV2 - SN:1   | 1029   |  |
| Californitieni procedure(s)  | QA CAL-22.v4<br>Calibration Proce  | adure for SAR Validation Sources   | s between 3-6 GHz  |
| Campration date:   | January 30, 2019   | 9  |  |
| All calibrations have been conclusiv   | ad in the closed laborato  | By facility: environment temperature (22 ± 3)  | C and humdity < 70%  |
| admitten Equipment oood (M&TE  | Ecritical for calibration)   |  |  |
| allinniich Equipmen eeen (M&TE<br>nimary Standaros   | critical for salbration)   | Cal Date (Certificate No.)   | Scheduled Calibration  |
| allinniicm Equipment eeee (M&TE<br>nimatry Standaros<br>ower meter NPIP  | Ecritical for calibration)   | Cal Dake (Certificate No.)<br>04-Apr 15 (No. 217-02672/02673)  |  |
| adilminicin Equipment elect (MATE<br>nimisity Standarcas<br>ower metler NRP<br>niwer alensor NRP-291   | critical for salbration)<br>ID #<br>SN: 104778   | Cal Date (Certificate No.)   | Scheduled Calicositon  |
| allinnich Equipmen asso (M&TE<br>himany Standaras<br>'owei noets/ NRP<br>'owei ansor NRP-291<br>'owei sensor NRP-291   | critical for salbration)<br>IO 4<br>SN( 104778<br>SN 103244  | Cal Dake (Certificate No.)<br>04-Apr 15 (No. 217-02672)02673)<br>04-Apr 18 (No. 217-02672)   | Scheduled Calicoalism<br>Apr-19<br>Apr-19  |
| adimatican Equipmenti opon (M&TE<br>nimitiny Standaroza<br>ower metisc NRP-<br>niwer bensor NRP-201<br>webr sensor NRP-201<br>ieterence 20 dB Attenuator   | critical for saibrailon)<br>ID V<br>SN: 104778<br>BN 103244<br>SN: 103245  | Cal Date (Certificate No.)<br>04-Apr-15 (No. 217-02672/02673)<br>04-Apr-18 (No. 217-02672)<br>04-Apr-18 (No. 217-02672)  | Scheduled Calicolicon<br>Apr-19<br>Apr-19<br>Apr-19  |
| adilination Equipment alea (M&Te<br>himainy Standards<br>ower metis: MPP<br>hiwer sensor NRP-291<br>ferences 20 dB Adensition<br>yope N mismatch confisienation<br>isterence Probe EX3DV4  | critical for sailbrailan)<br>SN: 104778<br>SN: 103244<br>SN: 103245<br>SN: 5081 (20k)<br>SN: 5047.2708327<br>SN: 3503  | Cal Date (Certificate No.)<br>04-Apr-18 (No. 217-02672/02673)<br>04-Apr-18 (No. 217-02672)<br>04-Apr-18 (No. 217-02673)<br>04-Apr-18 (No. 217-02682)<br>04-Apr-18 (No. 217-02682)<br>04-Apr-18 (No. 217-02682)<br>31-Dac-18 (No. EX3-3606_Dec18)   | Scheduled Calizzation<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Dac-19<br>Dac-19  |
| adimition Equipment aloon (M&TE<br>over meter MRP<br>niver adensor NRP-291<br>over sensor NRP-291<br>elemence 20 dB Ademution<br>ype N mismatch contaseation<br>istereoice Probe EX3DV4  | critical for sailbrailon)<br>SN: 104778<br>BN: 103244<br>SN: 108245<br>SN: 5081 (20k)<br>SN: 5047,27 06327   | Cal Date (Certificate No.)<br>04-Apr-18 (No. 217-02672/02673)<br>04-Apr-18 (No. 217-02672)<br>04-Apr-18 (No. 217-02682)<br>04-Apr-18 (No. 217-02682)<br>04-Apr-18 (No. 217-02683)  | Scheduled Calizzation<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19  |
| allination Equipment asso (M&TE<br>over mater NRP<br>nows assoc NRP-291<br>over sensor NRP-291<br>over sensor NRP-291<br>intersocs 20 dB Assenuator<br>ype-N mismatch contaseation<br>istancice Probe EX3DV4<br>WE4<br>econdary Standards  | critical for salbration)<br>ID V<br>SN 104778<br>SN 103244<br>SN 103245<br>SN 5058 (20k)<br>SN 5047,2 / 06327<br>SN 3803<br>SN 905<br>ID #   | Cal Date (Certificate No.)<br>04-Apr-15 (No. 217-02672/02673)<br>04-Apr-18 (No. 217-02672)<br>04-Apr-18 (No. 217-02673)<br>04-Apr-18 (No. 217-02682)<br>04-Apr-18 (No. 217-02682)<br>04-Apr-18 (No. 217-02683)<br>31-Dac-18 (No. EX3-3606_Dac18)<br>04-Oct-18 (No. DAE4-601_Oct18)<br>Check Date (in house)  | Scheduled Calizzalism<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Dec-19<br>Dec-19<br>Dec-18<br>Dec-18<br>Scheduled Check   |
| adimation Equipment asso (M&Te<br>over instandance<br>over instant NRP-291<br>over assist NRP-291<br>elemence 20 dB Ademusitor<br>ype-N mismatch combination<br>istance.ce Probe EX3DV4<br>WE4<br>econdary Standants<br>over metar EPM-442A  | Critical for Salbrailon)<br>ID V<br>SN: 104778<br>SN: 103244<br>SN: 103245<br>SN: 5058 (20k)<br>SN: 5047,2 / 06327<br>SN: 5047,2 / 06327<br>SN: 3603<br>SN: 905<br>ED #<br>SN: GB37480704  | Cal Date (Certificate No.)<br>04-Apr 16 (No. 217-02672)02673)<br>04-Apr 18 (No. 217-02672)<br>04-Apr 18 (No. 217-02673)<br>04-Apr 18 (No. 217-02682)<br>04-Apr 18 (No. 217-02682)<br>04-Apr 18 (No. EX3-3503_Dec18)<br>04-Oct 18 (No. DAE4-601_Oct18)<br>Check Date (in house)<br>07-Oct 15 (in bouse check Oct-18)  | Scheduled Calibiation<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-18<br>Scheduled Check<br>In house check: Decl-20  |
| addimation Equipment alea (M&Te<br>trimaty Standards<br>ower nearsor NRP-291<br>(ower sensor NRP-291<br>(ower sensor NRP-291<br>ieteronois 20 dB Alexandron<br>yope-N mismatch contoenation<br>istancois Probe EX3DV4<br>WE4<br>(accordary Standards)<br>cover minitar EPM-442A<br>cover minitar EPM-442A  | critical for sailbrailon)<br>ID V<br>SN: 104778<br>BN 103244<br>SN: 5050 (20k)<br>SN: 5057 (27) 06327<br>SN: 5047.27 06327<br>SN: 5047.27 06327<br>SN: 3503<br>SN: 6047<br>ED #<br>SN: GB37480704<br>SN: (JS37292783   | Cal Date (Certificate No.)<br>04-Apr-18 (No. 217-02672/02673)<br>04-Apr-18 (No. 217-02672)<br>04-Apr-18 (No. 217-02673)<br>04-Apr-18 (No. 217-02682)<br>04-Apr-18 (No. 217-02682)<br>04-Apr-18 (No. 217-02682)<br>04-Apr-18 (No. EX3-3603_Dec18)<br>04-Oct-18 (No. DAE4-601_Oct18)<br>Check Date (in house)<br>07-Oct-15 (in house check Oct-18)<br>07-Oct-15 (in house check Oct-18)  | Scheduled Calistation<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-18<br>Scheduled Check<br>In house check: Dec-20<br>in house check: Dec-20   |
| edimition Equipment also (M&Te<br>nimitiny Standards<br>ower neetse NRP-291<br>ower sensor NRP-291<br>elemende 20 dB Attenuation<br>seterence Probe EX3DV4<br>AE4<br>econdary Standoms<br>ower meeter EPM-442A<br>ower sensor HP 8481A<br>ower sensor HP 8481A   | Emical for saibnailan)<br>ID V<br>SN: 104778<br>BN 103244<br>SN: 108245<br>SN: 5047.27 06327<br>SN: 3503<br>SN: 5047<br>ID 4<br>SN: GB37480704<br>SN: US37292783<br>SN: WY41092317   | Cal Date (Certificate No.)<br>04-Apr-18 (No. 217-02672/02673)<br>04-Apr-18 (No. 217-02672)<br>04-Apr-18 (No. 217-02682)<br>04-Apr-18 (No. 217-02682)<br>04-Apr-18 (No. 217-02683)<br>31-Dac-18 (No. 217-02683)<br>31-Dac-18 (No. EX3-3603_Dec18)<br>04-Oct-18 (No. DAE4-601_Oct18)<br>Of-Oct-15 (in house)<br>07-Oct-15 (in house check Oct-18)<br>07-Oct-15 (in house check Oct-18)<br>07-Oct-15 (in house check Oct-18)  | Schecklied Calizzation<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19 |
| editination Equipment also (M&TE<br>over meter MRP<br>inversister NRP-291<br>ower sensor NRP-291<br>elemence 20 dB Alternation<br>(stareboe) Probe EX3DV4<br>AE4<br>econdary Standomb<br>over meter EPM-442A<br>over sensor HP 8481A<br>over sensor HP 8481A<br>over sensor HP 8481A   | critical for sailbrailon)<br>ID V<br>SN: 104778<br>BN 103244<br>SN: 5050 (20k)<br>SN: 5057 (27) 06327<br>SN: 5047.27 06327<br>SN: 5047.27 06327<br>SN: 3503<br>SN: 6047<br>ED #<br>SN: GB37480704<br>SN: (JS37292783   | Cal Date (Certificate No.)<br>04-Apr-18 (No. 217-02672/02673)<br>04-Apr-18 (No. 217-02672)<br>04-Apr-18 (No. 217-02673)<br>04-Apr-18 (No. 217-02682)<br>04-Apr-18 (No. 217-02682)<br>04-Apr-18 (No. 217-02682)<br>04-Apr-18 (No. EX3-3603_Dec18)<br>04-Oct-18 (No. DAE4-601_Oct18)<br>Check Date (in house)<br>07-Oct-15 (in house check Oct-18)<br>07-Oct-15 (in house check Oct-18)  | Scheduled Calistation<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-18<br>Scheduled Check<br>In house check: Dec-20<br>in house check: Dec-20   |
| adimition Equipment along (M&TE<br>over meter MRP<br>inversion NRP-291<br>ower sensor NRP-291<br>elemence 20 dB Ademution<br>isterence 20 dB Ademution<br>isterence Probe EX3DV4<br>WE4<br>econdary Standomts<br>over meter EPM-442A<br>over sensor HP 8481A<br>over sensor HP 8481A<br>over sensor HP 8481A   | Critical for Salbration)<br>ID V<br>SN 104778<br>SN 103244<br>SN 103245<br>SN 5047.2 / 06327<br>SN 5047.2 / 06327<br>SN 604<br>SN 605<br>ID #<br>SN 6837480704<br>SN 0337292783<br>SN 00572  | Cal Date (Certificate No.)<br>04-Apr-16 (No. 217-02672/02673)<br>04-Apr-18 (No. 217-02672)<br>04-Apr-18 (No. 217-02673)<br>04-Apr-18 (No. 217-02682)<br>04-Apr-18 (No. 217-02682)<br>04-Apr-18 (No. 217-02683)<br>31-Dac-18 (No. 217-02683)<br>31-Dac-18 (No. 217-02683)<br>04-Oct-18 (No. DAE4-601_Oct18)<br>04-Oct-18 (No. DAE4-601_Oct18)<br>07-Oct-15 (In house check Oct-18)<br>07-Oct-15 (In house check Oct-18)<br>07-Oct-15 (In house check Oct-18)<br>16-Jun-15 (In house check Oct-18)   | Scheduled Calizzation<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Scheduled Check<br>In house check: Det-20<br>In house check: Det-20<br>In house check: Det-20<br>In house check: Det-20   |
| Additionation Equipment aleas (M&TE<br>Primary Standards<br>Power means (MRP<br>Power sensor NRP-291<br>Verences 20 dB Ademunitor<br>ype-N mismatch contaseation<br>astaneous Probe EX3DV4<br>WEH<br>Reconctary Standards<br>Power means EPM-442A<br>Power sensor HP 8481A<br>Power sensor HP 8481A  | Emical for Salbrailan)<br>ID V<br>SN 104778<br>SN 103244<br>SN 103245<br>SN 5058 (20k)<br>SN 5047,2706327<br>SN: 3503<br>SN: 5051<br>ID #<br>SN: GB37480704<br>SN US37292783<br>SN: W31092317<br>SN: US31090477  | Cal Date (Certificate No.)<br>04-Apr-16 (No. 217-02672/02673)<br>04-Apr-18 (No. 217-02672)<br>04-Apr-18 (No. 217-02672)<br>04-Apr-18 (No. 217-02682)<br>04-Apr-18 (No. 217-02682)<br>04-Apr-18 (No. 217-02682)<br>04-Apr-18 (No. EX3-3606_Dec18)<br>04-Gct-18 (No. DAE4-601_Oct18)<br>Check Date (in house)<br>07-Oct-15 (in house check Oct-18)<br>07-Oct-15 (in house check Oct-18)<br>07-Oct-15 (in house check Oct-18)<br>16-Jun-15 (in house check Oct-18)<br>16-Jun-15 (in house check Oct-18)   | Scheduled Calizzation<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Scheduled Check<br>In house check: Det-20<br>In house check: Det-20<br>In house check: Det-20<br>In house check: Det-20   |
| Calification Equipment aleas (M&Te<br>Primainy Standards<br>Power sensor NRP-291<br>Power sensor NRP-291<br>Power sensor NRP-291<br>Paterencios 20 dB Ademutico<br>Pype-N mismatch contaseation<br>Paterecios Probe EX3DV4<br>Paket<br>Secondary Standards<br>Power mittér EPM-452A<br>Power sensor HP 8481A<br>Power sensor HP 84 | Emical for Salbrailan)<br>ID V<br>SN 104778<br>SN 103244<br>SN 103245<br>SN 5058 (20k)<br>SN 5047,2 / 06327<br>SN 5047,2 / 06327<br>SN 5057<br>SN 5   | Cal Date (Certificate No.)<br>04-Apr 18 (No. 217-02672)02673)<br>04-Apr 18 (No. 217-02672)<br>04-Apr 18 (No. 217-02673)<br>04-Apr 18 (No. 217-02682)<br>04-Apr 18 (No. 217-02682)<br>04-Apr 18 (No. 217-02682)<br>04-Apr 18 (No. EX3-3609_Dec18)<br>04-Oct 15 (No. Date 4-601_Oct 18)<br>07-Oct 15 (No. Oct 18)<br>07-Oct 18)   | Scheduled Calizzation<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Scheduled Check<br>In house check: Det-20<br>In house check: Det-20<br>In house check: Det-20<br>In house check: Det-20   |
| All calibrations have blev conducts Calibration Equipment used (M&TE Primary Standards Power sensor NRP-291 Power sensor NRP-291 Peterooce 20 48 Ademution Restreace Probe EX3DV4 DAE4 Secondary Standards Power metar EPM-442A Power sensor HP 8481A Power sensor HP 8481A RF generator RBS SMT-06 Natwork Analyzer Agient E8358A Calibrated by   | Critical for Salbrailon)<br>ID V<br>SN 104778<br>SN 103244<br>SN 103245<br>SN 5088 (20k)<br>SN 5047.2 / 06327<br>SN 5047.2 / 06327<br>SN 605<br>ID #<br>SN 005<br>SN | Cal Date (Certificate No.)<br>04-Apr-15 (No. 217-02672/02673)<br>04-Apr-18 (No. 217-02672)<br>04-Apr-18 (No. 217-02682)<br>04-Apr-18 (No. 217-02682)<br>04-Apr-19 ( | Scheduled Calizzation<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Apr-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Dec-19<br>Scheduled Check<br>In house check: Det-20<br>In house check: Det-20<br>In house check: Det-20   |

Certificate No: DSGHzV2-1023\_Jan19

Page 1 of 9

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

Company's sole except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路 134 號 SGS Taiwan Ltd.

f (886-2) 2298-0488



**Calibration Laboratory of** Schmid & Partner Engineering AG Zoughnusstrasse 43, 6004 Zurich, Switzerland



elzeringhor Katibriertierin S Service suisse d'étalonnage C Servizio svizzero di tarutura s Swiss Calibration Service

Accreditation No.: SCS 0108

Appreciated by the Swiss Appreciation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilational Agreement for the recognition of calibration certification

#### Gloscon

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

#### Additional Documentation:

e) DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL. The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna leed 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: D5GHzY2-1020\_Jan19

Page 2 of 9

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明,此報告結果僅對測試之樣品負責,同時比樣品僅保留<sup>90</sup>天。本報告未經本公司書面許可,不可部份複製。 This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <u>www.sgs.com/terms\_and\_conditions.htm</u> and for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sqs.com/terms e-document.htm. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

> No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路 134號 SGS Taiwan Ltd.

t (886-2) 2299-3279 台灣檢驗科技股份有限公司

f (886-2) 2298-0488



#### Measurement Conditions

| DASY system configuration | 35.1 | ar as | THE | given on | page 1. |
|---------------------------|------|-------|-----|----------|---------|
|                           |      |       |     | 1        |         |

| DASY Version                 | DASY5  | V52.10.2                         |
|------------------------------|--|----------------------------------|
| Extrapolation                | Advanced Extrapolation   |                                  |
| Phantom                      | Modular Flat Phantom V5 D  |                                  |
| Distance Dipole Center - TSL | 10 mini  | with Spacer                      |
| Zoom Scan Resolution         | dx, dy = 4.0 mm; dz = 1.4 mm   | Graded Ratio = 1.4 (Z direction) |
| Frequency                    | 5200 MHz ± 1 MHz<br>5300 MHz ± 1 MHz<br>5600 MHz ± 1 MHz<br>5600 MHz ± 1 MHz |                                  |

## Head TSL parameters at 5200 MHz

The following parameters and calculations were applied

|   | Temperature   | Permittivity   | Conductivity     |
|---|---------------|----------------|------------------|
| Nominal Head TSL parameters             | 72.0 °C       | 36.0           | 4,66 mitto/m     |
| Measured Head TSL parameters            | (22.0±0.2) °C | $36.6 \pm 6$ % | 4.49 mho/m = 6 % |
| Head TSL temperature change during test | < 0.5 °C      |                | -                |

## SAR result with Head TSL at 5200 MHz

| SAR everaged over 1 cm <sup>2</sup> (1 g) of Head TSL                   | Contilion                         |                          |
|---|-----------------------------------|--------------------------|
| SAR measured  | 100 mW input power                | 7.69 W/kg                |
| SAR for nominal Head TSL parameters                                     | normalized to 1W                  | 79.2 W/kg ± 19.9 % (k=2) |
|   |                                   |                          |
|   | 1                                 |                          |
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL                 | contlition                        |                          |
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL<br>SAR measured | contilition<br>100 mW input pawar | 2.24 W/kg                |

Gentiliante Nie D5GHzV2-1023\_Jan 19

Page 3 rd 8

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明,此報告結果僅對測試之樣品負責,同時此樣品僅保留90天。本報告未經本公司書面許可,不可部份複製。 This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <u>www.sgs.com/terms\_and\_conditions.htm</u> and for electronic format documents, subject to Terms and Conditions for Electronic Documents at <u>www.sgs.com/terms\_ad\_conditions.htm</u> and for electronic format therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

f (886-2) 2298-0488



#### Head TSL parameters at 5300 MHz

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 35.9         | 4.76 mbo/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 28.6±6%      | 4:59 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        |              | -                |

#### SAR result with Head TSL at 5300 MHz

| SAR averaged over 1 cm <sup>2</sup> (1 g) of Head TSL                   | Condition                       |                            |
|---|---------------------------------|----------------------------|
| SAR measured  | 100 mW input power              | 8.24 W/kg                  |
| SAR for nominal Heed TSL parameters.                                    | W of betalemon                  | #2.6 W / kg = 19.9 % (k=2) |
|   |                                 |                            |
| SAR averaged over 10 cm <sup>2</sup> (10 g) of Head TSL                 | condition                       |                            |
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL<br>SAR measured | condition<br>100 mW input power | 2.34 W/kg                  |

#### Head TSL parameters at 5600 MHz

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 35.5         | 5.07 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) "C | 362±6%       | 4.90 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        |              |                  |

#### SAR result with Head TSL at 5600 MHz

| SAR averaged over 1 cm <sup>1</sup> (1 g) of Head TSL | Condition              |                          |
|---|------------------------|--------------------------|
| SAR metsurad  | 100 mW input power     | 8.55 W/kg                |
| SAR for nominal Head TSL parameters                   | when the second second | 85.7 W/kg ± 10,9 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                          |
|---|--------------------|--------------------------|
| SAR measured  | 100 mW input power | 2 43 W/kg                |
| SAR for nominal Head TSL parameters                     | Wt of besitamion   | 24.4 W/kg ± 18.5 % (k=2) |

Certificate No: D5GHzV2-1023\_Jan19

Page 4 of 9

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

t (886-2) 2299-3279 台灣檢驗科技股份有限公司

f (886-2) 2298-0488

```
www.tw.sas.com
```

除非另有說明,此報告結果僅對測試之樣品負責,同時此樣品僅保留90天。本報告未經本公司書面許可,不可部份複製。 This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <u>www.sgs.com/terms\_and\_conditions.htm</u> and for electronic format documents, subject to Terms and Conditions for Electronic Documents at <u>www.sgs.com/terms\_ad\_conditions.htm</u> and for electronic format therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.



#### Head TSL parameters at 5800 MHz

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 35.3         | 5.27 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) *O | 35.9 ± 6 %   | 5.11 mho/m ± 6 % |
| Head TSL temperature change during test | < 0.5 °C        | _            | -                |

### SAR result with Head TSL at 5800 MHz

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL                   | Condition                       |                          |
|---|---------------------------------|--------------------------|
| SAR measured  | 100 mW input power              | 8.02 W/kg                |
| SAR for nominal Head TSL paramaters                                     | normalized to 1W                | 80.4 W/kg ± 19.9 % (k=2) |
|   |                                 |                          |
| SAR averaged over 10 cm <sup>2</sup> (10 g) of Head TSL                 | condition                       |                          |
| SAR averaged over 10 cm <sup>2</sup> (10 g) of Head TSL<br>SAR measured | condition<br>100 mW input power | 2.26 W/kg                |

Cartificate No: D5GHzV2-1023\_Jan19

Page 5 of 9

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明,此報告結果僅對測試之樣品負責,同時此樣品僅保留90天。本報告未經本公司書面許可,不可部份複製。 This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <u>www.sgs.com/terms\_and\_conditions.htm</u> and for electronic format documents, subject to Terms and Conditions for Electronic Documents at <u>www.sgs.com/terms\_ad\_conditions.htm</u> and for electronic format therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路 134 號 SGS Taiwan Ltd.

t (886-2) 2299-3279 台灣檢驗科技股份有限公司

f (886-2) 2298-0488

www.tw.sgs.com



#### Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5200 MHz

| Impedance, Intrisformed to feed point | 51.2 LI - 8.5 JD |
|---------------------------------------|------------------|
| Return Losa                           | - 21.4 dB        |

Antenna Parameters with Head TSL at 5300 MHz

| Impedance, transformed to feed point | 51.0 Ω - 3.9 Ω |  |
|--------------------------------------|----------------|--|
| Return Loss                          | -28.0 dB       |  |

#### Antenna Parameters with Head TSL at 5600 MHz

| Impedance, transformed to feed point | 54.9 Q - 1.6 JQ |
|--------------------------------------|-----------------|
| Return Loss                          | - 26.2 dB       |

Antenna Parameters with Head TSL at 5800 MHz

| Impedance, transformed to feed point | 55.8 II + 1.3 jiI |   |
|--------------------------------------|-------------------|---|
| Return Loss                          | - 25,0 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 teedpoint can be measured.

The dipole is made of standard semingid coaxiel cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is literatore short-circulind for DC-signals. On some of the dipoles, small and capa are added to the pipole 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 of the soldered connections near the feedpoint may be damaged.

#### Additional EUT Data

| Manufactured by          | SPEAG |
|--------------------------|-------|
| it in the initial set of |       |

Certificate No. D5GHzV2-1023\_Jan19

Page 6 of 9

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明,此報告結果僅對測試之樣品負責,同時比樣品僅保留<sup>90</sup>天。本報告未經本公司書面許可,不可部份複製。 This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <u>www.sgs.com/terms\_and\_conditions.htm</u> and for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sqs.com/terms e-document.htm. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路 134號 SGS Taiwan Ltd.

t (886-2) 2299-3279 台灣檢驗科技股份有限公司

f (886-2) 2298-0488



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

Date: 30.01.2010

Test Laboratory; SPEAG, Zurich, Switzerland

## DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1023

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz Medium parameters used: I = 5200 MHz; n = 4.49 S/m; p<sub>1</sub> = 36.8; p = 1000 kg/m<sup>3</sup>. Medium parameters used: f = 5300 MHz;  $\sigma = 4.59$  S/m;  $\epsilon = 36.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>. Medium parameters used: l = 5600 MHz;  $\sigma = 4.9$  S/m;  $\epsilon_i = 36.2$ ; p = 1000 kg/m<sup>3</sup>. Medium parameters used: f = 5800 MHz;  $\sigma = 5.11 \text{ S/m}$ ;  $\rho = 35.9$ ;  $\rho = 1000 \text{ kg/m}^3$ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-20)1)

DASY52 Configuration

- Probe; EX3DV4 SN3503; ConvF(5.69, 5.69, 5.69) @ 5200 MHz, ConvF(5.45, 5.45, 5.45) @ 5300 MHz, ConvF(5, 5, 5) @ 5600 MHz, ConvF(4.96, 4.96, 4.96) @ 5800 MHz; Calibrated: 31.12.2018
- Sensor-Surface: (.4mm (Mechanical Surface Detection))
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 75.39 V/m; Power Drift = 0.01 dB Peak SAR (extrapolated) = 28.7 W/kg SAR(1 g) = 7.89 W/kg; SAR(10 g) = 2.24 W/kg Maximum value of SAR (measured) = 18.0 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 76.71 V/m; Power Drift = 0.03 dB Peak SAR (extrapolated) = 29.9 W/kg SAR(1 g) = 8.24 W/kg; SAR(10 g) = 2.34 W/kg Maximum value of SAR (measured) = 18.8 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4num (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 76.95 V/m; Power Drift = 0.06 dB Peak SAR (extrapolated) = 32.9 W/kg SAR(1 g) = 8.55 W/kg; SAR(10 g) = 2.43 W/kg Maximum value of SAR (measured) = 20.1 W/kg

Certificate No: 05GHzV2-1025\_Jan19

Page 7 of 9

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明,此報告結果僅對測試之樣品負責,同時比樣品僅保留<sup>90</sup>天。本報告未經本公司書面許可,不可部份複製。 This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <u>www.sgs.com/terms\_and\_conditions.htm</u> and for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sqs.com/terms e-document.htm. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

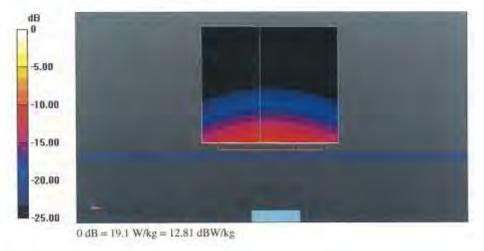
No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路 134號 SGS Taiwan Ltd.

t (886-2) 2299-3279 台灣檢驗科技股份有限公司

f (886-2) 2298-0488



Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 74.52 V/m; Power Drift = 0.04 dB Peak SAR (extrapolated) = 32.1 W/kg SAR(1 g) = 8.02 W/kg; SAR(10 g) = 2.26 W/kg Maximum value of SAR (measured) = 19.1 W/kg



Certificate No: D5GHzV2-1023\_Jan19

Page 8 of 9

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明,此報告結果僅對測試之樣品負責,同時比樣品僅保留<sup>90</sup>天。本報告未經本公司書面許可,不可部份複製。 This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <u>www.sgs.com/terms\_and\_conditions.htm</u> and for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sqs.com/terms e-document.htm. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

No.134,Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803/新北市五股區新北產業園區五工路 134號 SGS Taiwan Ltd.

t (886-2) 2299-3279 台灣檢驗科技股份有限公司

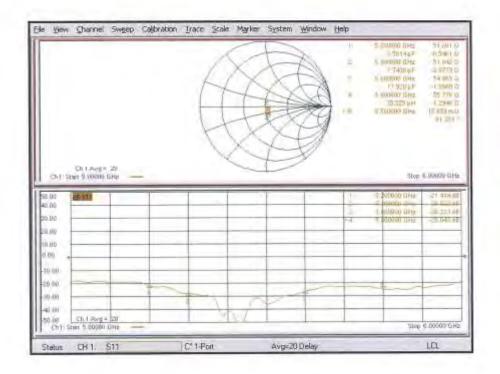
f (886-2) 2298-0488

www.tw.sas.com



Report No. : EN/2019/70012 Rev: 01 Page: 16 of 16

Impedance Measurement Plot for Head TSL



Centificate No: D5GHzV2-1023\_Jan19

Page 9 of 9

# - End of report -

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明,此報告結果僅對測試之樣品負責,同時此樣品僅保留90天。本報告未經本公司書面許可,不可部份複製。 This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <u>www.sgs.com/terms\_and\_conditions.htm</u> and for electronic format documents, subject to Terms and Conditions for Electronic Documents at <u>www.sgs.com/terms\_ad\_conditions.htm</u> and for electronic format therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

t (886-2) 2299-3279 台灣檢驗科技股份有限公司

f (886-2) 2298-0488