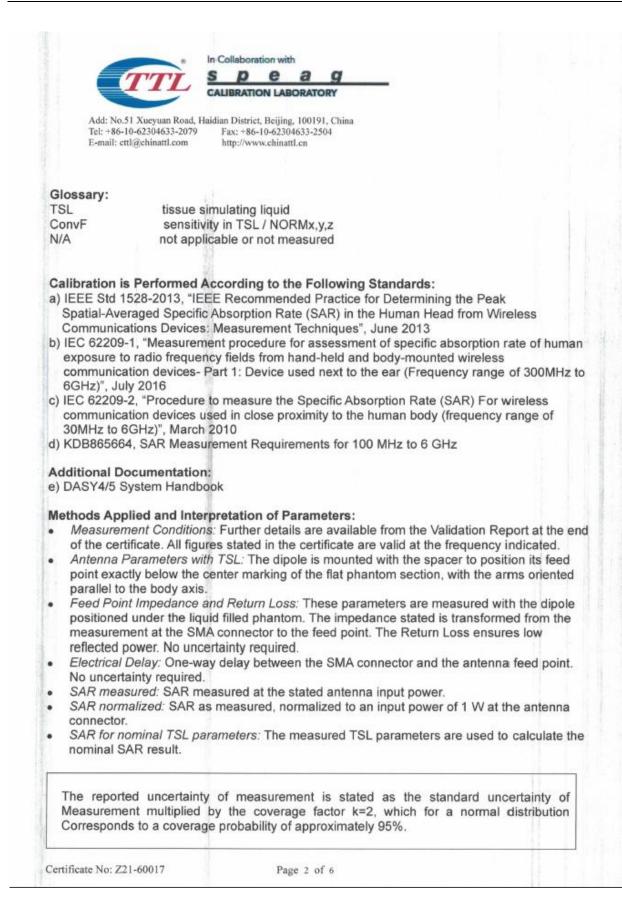
# 1.1. D835V2 Dipole Calibration Certificate

| Tel: +86-10-62304<br>E-mail: cttl@china   |   | +86-10-62304633-2504   |   |
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| Client HTW  |   |  | 1-60017   |
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| Object  | D835V   | /2 - SN: 4d238   |   |
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| Calibration date:   | Januar  | ry 22, 2021  |   |
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| numidity<70%.   |   | the closed laboratory facility: environment<br>for calibration)  | temperature(22±3)°C and   |
| humidity<70%.<br>Calibration Equipment used   | d (M&TE critical f  | for calibration)   |   |
| numidity<70%.<br>Calibration Equipment used   |   | for calibration)<br>Cal Date(Calibrated by, Certificate No.)   | Scheduled Calibration   |
| numidity<70%.<br>Calibration Equipment used<br>Primary Standards  | I (M&TE critical f  | for calibration)   |   |
| numidity<70%.<br>Calibration Equipment used<br>Primary Standards<br>Power Meter NRP2<br>Power sensor NRP6A<br>ReferenceProbe EX3DV4   | ID #<br>106276<br>101369<br>SN 7600   | for calibration)<br>Cal Date(Calibrated by, Certificate No.)<br>12-May-20 (CTTL, No.J20X02965)<br>12-May-20 (CTTL, No.J20X02965)<br>30-Nov-20(CTTL-SPEAG,No.Z20-60421)   | Scheduled Calibration<br>May-21<br>May-21<br>Nov-21   |
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| numidity<70%.<br>Calibration Equipment used<br>Primary Standards<br>Power Meter NRP2<br>Power sensor NRP6A<br>ReferenceProbe EX3DV4   | d (M&TE critical f<br>ID #<br>106276<br>101369<br>SN 7600<br>SN 771   | for calibration)<br>Cal Date(Calibrated by, Certificate No.)<br>12-May-20 (CTTL, No.J20X02965)<br>12-May-20 (CTTL, No.J20X02965)<br>30-Nov-20(CTTL-SPEAG,No.Z20-60421)   | Scheduled Calibration<br>May-21<br>May-21<br>Nov-21<br>Feb-21   |
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| numidity<70%.<br>Calibration Equipment used<br>Primary Standards<br>Power Meter NRP2<br>Power sensor NRP6A<br>ReferenceProbe EX3DV4<br>DAE4<br>Secondary Standards<br>Signal Generator E4438C                           | ID #<br>106276<br>101369<br>SN 7600<br>SN 771<br>ID #<br>MY49071430   | for calibration)<br>Cal Date(Calibrated by, Certificate No.)<br>12-May-20 (CTTL, No.J20X02965)<br>12-May-20 (CTTL, No.J20X02965)<br>30-Nov-20(CTTL-SPEAG,No.Z20-60421)<br>10-Feb-20(CTTL-SPEAG,No.Z20-60017)<br>Cal Date(Calibrated by, Certificate No.)<br>25-Feb-20 (CTTL, No.J20X00516)   | Scheduled Calibration<br>May-21<br>May-21<br>Nov-21<br>Feb-21<br>Scheduled Calibration<br>Feb-21  |
| numidity<70%.<br>Calibration Equipment used<br>Primary Standards<br>Power Meter NRP2<br>Power sensor NRP6A<br>ReferenceProbe EX3DV4<br>DAE4<br>Secondary Standards<br>Signal Generator E4438C                           | ID #<br>106276<br>101369<br>SN 7600<br>SN 771<br>ID #<br>MY49071430   | for calibration)<br>Cal Date(Calibrated by, Certificate No.)<br>12-May-20 (CTTL, No.J20X02965)<br>12-May-20 (CTTL, No.J20X02965)<br>30-Nov-20(CTTL-SPEAG,No.Z20-60421)<br>10-Feb-20(CTTL-SPEAG,No.Z20-60017)<br>Cal Date(Calibrated by, Certificate No.)<br>25-Feb-20 (CTTL, No.J20X00516)   | Scheduled Calibration<br>May-21<br>May-21<br>Nov-21<br>Feb-21<br>Scheduled Calibration<br>Feb-21  |
| numidity<70%.<br>Calibration Equipment used<br>Primary Standards<br>Power Meter NRP2<br>Power sensor NRP6A<br>ReferenceProbe EX3DV4<br>DAE4<br>Secondary Standards<br>Signal Generator E4438C<br>NetworkAnalyzer E5071C | d (M&TE critical f<br>ID #<br>106276<br>101369<br>SN 7600<br>SN 771<br>ID #<br>MY49071430<br>MY46110673                                 | for calibration)<br>Cal Date(Calibrated by, Certificate No.)<br>12-May-20 (CTTL, No.J20X02965)<br>12-May-20 (CTTL, No.J20X02965)<br>30-Nov-20(CTTL-SPEAG,No.Z20-60421)<br>10-Feb-20(CTTL-SPEAG,No.Z20-60017)<br>Cal Date(Calibrated by, Certificate No.)<br>25-Feb-20 (CTTL, No.J20X00516)<br>10-Feb-20 (CTTL, No.J20X00515)                       | Scheduled Calibration<br>May-21<br>May-21<br>Nov-21<br>Feb-21<br>Scheduled Calibration<br>Feb-21<br>Feb-21  |
| Calibration Equipment used<br>Primary Standards<br>Power Meter NRP2<br>Power sensor NRP6A<br>ReferenceProbe EX3DV4<br>DAE4<br>Secondary Standards<br>Signal Generator E4438C<br>NetworkAnalyzer E5071C                  | 4 (M&TE critical f<br>1D #<br>106276<br>101369<br>SN 7600<br>SN 771<br>ID #<br>MY49071430<br>MY46110673<br>Name<br>Zhao Jing            | for calibration) Cal Date(Calibrated by, Certificate No.) 12-May-20 (CTTL, No.J20X02965) 12-May-20 (CTTL, No.J20X02965) 30-Nov-20(CTTL-SPEAG,No.Z20-60421) 10-Feb-20(CTTL-SPEAG,No.Z20-60017) Cal Date(Calibrated by, Certificate No.) 25-Feb-20 (CTTL, No.J20X00516) 10-Feb-20 (CTTL, No.J20X00515) Function SAR Test Engineer                    | Scheduled Calibration<br>May-21<br>May-21<br>Nov-21<br>Feb-21<br>Scheduled Calibration<br>Feb-21<br>Feb-21  |
| Calibration Equipment used<br>Primary Standards<br>Power Meter NRP2<br>Power sensor NRP6A<br>ReferenceProbe EX3DV4<br>DAE4<br>Secondary Standards<br>Signal Generator E4438C<br>NetworkAnalyzer E5071C                  | d (M&TE critical f<br>ID #<br>106276<br>101369<br>SN 7600<br>SN 771<br>ID #<br>MY49071430<br>MY46110673<br>Name                         | for calibration)<br>Cal Date(Calibrated by, Certificate No.)<br>12-May-20 (CTTL, No.J20X02965)<br>12-May-20 (CTTL, No.J20X02965)<br>30-Nov-20(CTTL-SPEAG,No.Z20-60421)<br>10-Feb-20(CTTL-SPEAG,No.Z20-60017)<br>Cal Date(Calibrated by, Certificate No.)<br>25-Feb-20 (CTTL, No.J20X00516)<br>10-Feb-20 (CTTL, No.J20X00515)<br>Function           | Scheduled Calibration<br>May-21<br>May-21<br>Nov-21<br>Feb-21<br>Scheduled Calibration<br>Feb-21<br>Feb-21  |
| numidity<70%.<br>Calibration Equipment used<br>Primary Standards<br>Power Meter NRP2<br>Power sensor NRP6A<br>ReferenceProbe EX3DV4<br>DAE4<br>Secondary Standards<br>Signal Generator E4438C<br>NetworkAnalyzer E5071C | 4 (M&TE critical f<br>1D #<br>106276<br>101369<br>SN 7600<br>SN 771<br>ID #<br>MY49071430<br>MY46110673<br>Name<br>Zhao Jing            | for calibration) Cal Date(Calibrated by, Certificate No.) 12-May-20 (CTTL, No.J20X02965) 12-May-20 (CTTL, No.J20X02965) 30-Nov-20(CTTL-SPEAG,No.Z20-60421) 10-Feb-20(CTTL-SPEAG,No.Z20-60017) Cal Date(Calibrated by, Certificate No.) 25-Feb-20 (CTTL, No.J20X00516) 10-Feb-20 (CTTL, No.J20X00515) Function SAR Test Engineer                    | Scheduled Calibration<br>May-21<br>May-21<br>Nov-21<br>Feb-21<br>Scheduled Calibration<br>Feb-21<br>Feb-21  |
| humidity<70%.<br>Calibration Equipment used<br>Primary Standards<br>Power Meter NRP2<br>Power sensor NRP6A<br>ReferenceProbe EX3DV4<br>DAE4<br>Secondary Standards<br>Signal Generator E4438C                           | d (M&TE critical f<br>ID #<br>106276<br>101369<br>SN 7600<br>SN 771<br>ID #<br>MY49071430<br>MY46110673<br>Name<br>Zhao Jing<br>Lin Hao | for calibration) Cal Date(Calibrated by, Certificate No.) 12-May-20 (CTTL, No.J20X02965) 12-May-20 (CTTL, No.J20X02965) 30-Nov-20(CTTL-SPEAG,No.Z20-60421) 10-Feb-20(CTTL-SPEAG,No.Z20-60017) Cal Date(Calibrated by, Certificate No.) 25-Feb-20 (CTTL, No.J20X00516) 10-Feb-20 (CTTL, No.J20X00515)  Function SAR Test Engineer SAR Test Engineer | Scheduled Calibration<br>May-21<br>May-21<br>Nov-21<br>Feb-21<br>Scheduled Calibration<br>Feb-21<br>Feb-21<br>Signature   |

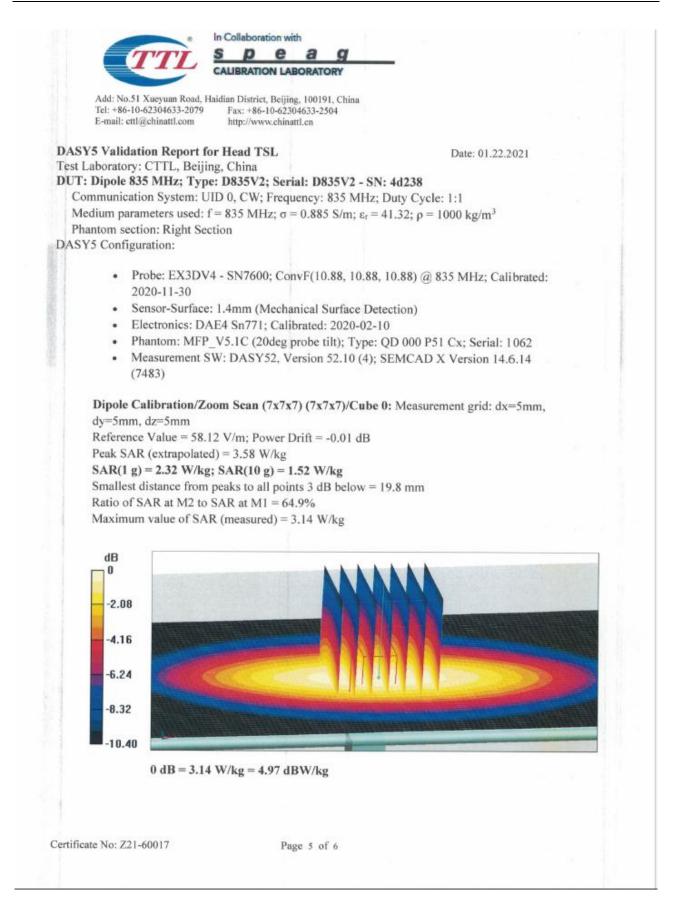


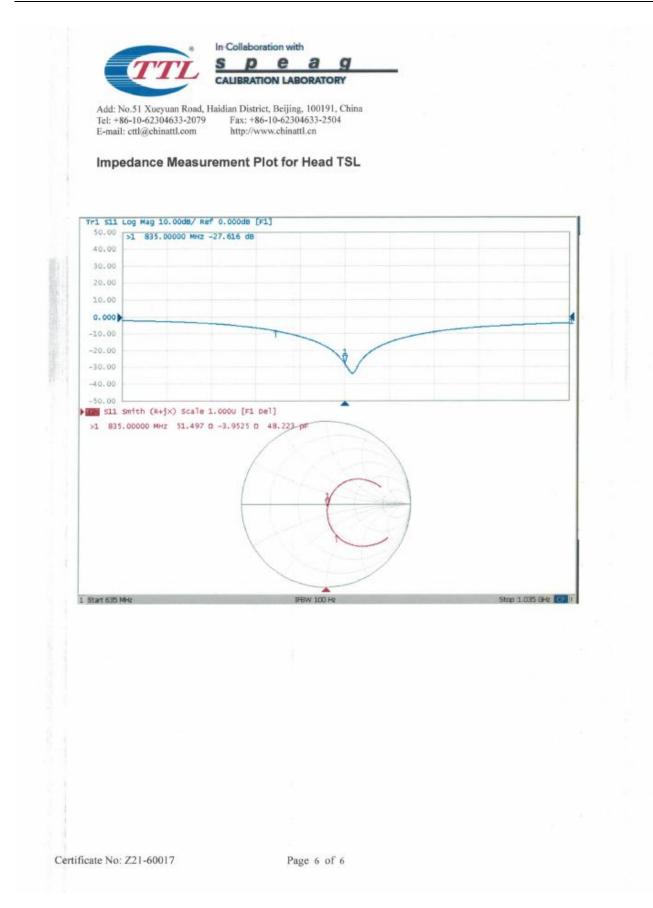
| e li   | Collaboration w  | ith                    |                                    |        |                              |
|--|--|------------------------|------------------------------------|--------|------------------------------|
| TTT  | spe  | ag                     |                                    |        |                              |
|  | ALIBRATION LA  | BORATORY               |                                    |        |                              |
| Add: No.51 Xueyuan Road, Hai<br>Tel: +86-10-62304633-2079<br>E-mail: cttl@chinattl.com | dian District, Beiji<br>Fax: +86-10-623<br>http://www.chin | 304633-2504            |                                    |        |                              |
| DASY system configuration, as fa   | ar as not given o  | n page 1.              |                                    |        |                              |
| DASY Version   |  | DASY52                 |                                    |        | V52.10.4                     |
| Extrapolation  | Advan  | ced Extrapolation      |                                    |        |                              |
| Phantom  | Triple   | Flat Phantom 5.1C      |                                    |        |                              |
| Distance Dipole Center - TSL   |  | 15 mm                  |                                    | w      | ith Spacer                   |
| Zoom Scan Resolution   | dx,  | dy, dz = 5 mm          |                                    |        |                              |
| Frequency  | 835  | 5 MHz ± 1 MHz          |                                    |        |                              |
| ead TSL parameters<br>The following parameters and cal                                 | culations were a   | pplied.<br>Temperature | Permitti                           | vity   | Conductivity                 |
| Nominal Head TSL parameter   | rs   | 22.0 °C                | 41.5                               |        | 0.90 mho/m                   |
| Measured Head TSL paramet  | ers  | (22.0 ± 0.2) °C        | 41.3 ± 6                           | 8 %    | 0.89 mlho/m ± 6 %            |
| Head TSL temperature chang   | e during test  | <1.0 °C                |                                    |        |                              |
| AR result with Head TSL  | - 1  |                        | 1                                  |        |                              |
| SAR averaged over 1 $cm^3$ (1  | g) of Head TSL   | Condi                  | tion                               |        |                              |
| SAR measured   |  | 250 mW ir              | put power                          |        | 2.32 W/kg                    |
| SAR for nominal Head TSL par   | ameters  | normalize              | ed to 1W                           | 9.39 V | V/kg ± 18.8 % ( <i>k</i> =2) |
| SAR averaged over 10 $cm^3$ (f   | 10 g) of Head TS   | L Condi                | tion                               |        |                              |
| SAR measured   |  | 250 mW in              | put power                          |        | 1.52 W/kg                    |
|  |  |                        | and the last set of the set of the |        |                              |

Certificate No: Z21-60017

Page 3 of 6

| Add: No.51 Xueyuan Road, Haio<br>Tel: +86-10-62304633-2079<br>E-mail: ettl@chinattl.com  | dian District, Beijing, 100191, China<br>Fax: +86-10-62304633-2504<br>http://www.chinattl.en   |  |  |
|--|--|--|--|
| Appendix (Additional asse  | essments outside the scop  | e of CNAS LOSTO  |  |
| Appendix (Additional asso  | samenta outaide die acop   | e of chas Lusto)   |  |
| Antenna Parameters with I  | Head TSL   |  |  |
| Impedance, transformed to feed   | d point  | 51.5Ω- 3.95jΩ  |  |
| Return Loss  |  | - 27.6dB   |  |
|  |  |  |  |
| General Antenna Paramete   | ers and Design   |  |  |
| Electrical Delay (one direction)   |  | 1.298 ns   |  |
|  |  |  |  |
| The dipole is made of standard s<br>connected to the second arm of t<br>of the dipoles, small end caps ar<br>according to the position as expl<br>affected by this change. The ove<br>No excessive force must be appl  | semirigid coaxial cable. The cent<br>the dipole. The antenna is therefu-<br>e added to the dipole arms in ord<br>ained in the "Measurement Cond<br>erall dipole length is still according<br>lied to the dipole arms, because<br>may be damaged. | ore short-circuited for DC-<br>der to improve matching w<br>litions" paragraph. The SA<br>g to the Standard.                               | signals. On some<br>hen loaded<br>R data are not |
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# 1.2. D1900V2 Dipole Calibration Certificate

| E-mail: cttl@chinattl.  |   |   | tattl.cn  |  |       |
|---|---|---|---|--|-------|
| Client HTW  |   |   | Certificate No: Z21   | 1-60019  |       |
| ALIBRATION CE   | RTIFICATI   | E   |   |  |       |
| bject   | D1900V  | 2 - SN  | : 5d226   |  |       |
| calibration Procedure(s)  | FF-Z11-<br>Calibrati  | 003-01<br>on Pro  | 1<br>ocedures for dipole validation kits  |  |       |
| Calibration date:   | January   | 22, 20  | 021   |  |       |
| humidity<70%.   | rtificate.<br>conducted in t  | he clo  | osed laboratory facility: environment   |  |       |
| bages and are part of the ce<br>All calibrations have been<br>humidity<70%.<br>Calibration Equipment used   | rtificate.<br>conducted in t  | he clo<br>or calib<br>Cal   | osed laboratory facility: environment<br>oration)<br>Date(Calibrated by, Certificate No.)   | temperature(22±3)°C  | and   |
| pages and are part of the ce<br>All calibrations have been<br>humidity<70%.<br>Calibration Equipment used<br>Primary Standards<br>Power Meter NRP2  | rtificate.<br>conducted in t<br>(M&TE critical fo<br>ID #<br>106276   | he clo<br>or calib<br>Cal<br>12-W                                   | osed laboratory facility: environment<br>oration)<br>Date(Calibrated by, Certificate No.)<br>flay-20 (CTTL, No.J20X02965)   | temperature(22±3)°C<br>Scheduled Calibra<br>May-21   | and   |
| ages and are part of the ce<br>All calibrations have been<br>numidity<70%.<br>Calibration Equipment used<br>Primary Standards<br>Power Meter NRP2<br>Power sensor NRP6A   | rtificate.<br>conducted in t<br>(M&TE critical fo<br>ID #<br>106276<br>101369   | he ck<br>or calib<br>Cal<br>12-W<br>12-W                            | osed laboratory facility: environment<br>oration)<br>Date(Calibrated by, Certificate No.)<br>flay-20 (CTTL, No.J20X02965)<br>flay-20 (CTTL, No.J20X02965)   | temperature(22±3)°C  | and   |
| ages and are part of the ce<br>All calibrations have been<br>numidity<70%.<br>Calibration Equipment used<br>Primary Standards<br>Power Meter NRP2   | rtificate.<br>conducted in t<br>(M&TE critical fo<br>ID #<br>106276   | ne ck<br>or calib<br>12-N<br>12-N<br>30-N                           | osed laboratory facility: environment<br>oration)<br>Date(Calibrated by, Certificate No.)<br>flay-20 (CTTL, No.J20X02965)   | temperature(22±3)°C<br>Scheduled Calibra<br>May-21<br>May-21                                       | and   |
| ages and are part of the ce<br>All calibrations have been<br>humidity<70%.<br>Calibration Equipment used<br>Primary Standards<br>Power Meter NRP2<br>Power sensor NRP6A<br>ReferenceProbe EX3DV4<br>DAE4  | rtificate.<br>conducted in t<br>(M&TE critical for<br>ID #<br>106276<br>101369<br>SN 7600<br>SN 771   | ne ck<br>pr calib<br>12-N<br>12-N<br>30-N<br>10-F                   | osed laboratory facility: environment<br>oration)<br>Date(Calibrated by, Certificate No.)<br>May-20 (CTTL, No.J20X02965)<br>May-20 (CTTL, No.J20X02965)<br>Nov-20(CTTL-SPEAG,No.Z20-60421)<br>Feb-20(CTTL-SPEAG,No.Z20-60017)   | temperature(22±3)°C<br>Scheduled Calibra<br>May-21<br>May-21<br>Nov-21                             | ation |
| ages and are part of the ce<br>All calibrations have been<br>numidity<70%.<br>Calibration Equipment used<br>Primary Standards<br>Power Meter NRP2<br>Power sensor NRP6A<br>ReferenceProbe EX3DV4  | rtificate.<br>conducted in t<br>(M&TE critical fo<br>ID #<br>106276<br>101369<br>SN 7600<br>SN 7610<br>SN 771<br>ID #<br>ID #                             | ne clo<br>or calib<br>12-W<br>12-W<br>30-N<br>10-F<br>Cal I<br>25-F | osed laboratory facility: environment<br>oration)<br>Date(Calibrated by, Certificate No.)<br>fay-20 (CTTL, No.J20X02965)<br>May-20 (CTTL, No.J20X02965)<br>Nov-20(CTTL-SPEAG,No.Z20-60421)  | Scheduled Calibra<br>May-21<br>Nov-21<br>Feb-21  | ation |
| All calibrations have been<br>humidity<70%.<br>Calibration Equipment used<br>Primary Standards<br>Power Meter NRP2<br>Power sensor NRP6A<br>ReferenceProbe EX3DV4<br>DAE4<br>Secondary Standards<br>Signal Generator E4438C                           | rtificate.<br>conducted in t<br>(M&TE critical fo<br>ID #<br>106276<br>101369<br>SN 7600<br>SN 7610<br>SN 771<br>ID #<br>ID #                             | ne clo<br>or calib<br>12-W<br>12-W<br>30-N<br>10-F<br>Cal I<br>25-F | osed laboratory facility: environment<br>oration)<br>Date(Calibrated by, Certificate No.)<br>May-20 (CTTL, No.J20X02965)<br>May-20 (CTTL, No.J20X02965)<br>Nov-20(CTTL-SPEAG,No.Z20-60421)<br>Feb-20(CTTL-SPEAG,No.Z20-60017)<br>Date(Calibrated by, Certificate No.)<br>Feb-20 (CTTL, No.J20X00516)                                | Scheduled Calibra<br>May-21<br>May-21<br>Nov-21<br>Feb-21<br>Scheduled Calibra<br>Feb-21           | ation |
| All calibrations have been<br>humidity<70%.<br>Calibration Equipment used<br>Primary Standards<br>Power Meter NRP2<br>Power sensor NRP6A<br>ReferenceProbe EX3DV4<br>DAE4<br>Secondary Standards<br>Signal Generator E4438C                           | rtificate.<br>conducted in t<br>(M&TE critical fo<br>ID #<br>106276<br>101369<br>SN 7600<br>SN 771<br>ID #<br>MY49071430<br>MY46110673                    | ne clo<br>or calib<br>12-W<br>12-W<br>30-N<br>10-F<br>Cal I<br>25-F | osed laboratory facility: environment<br>oration)<br>Date(Calibrated by, Certificate No.)<br>May-20 (CTTL, No.J20X02965)<br>May-20 (CTTL, No.J20X02965)<br>Nov-20(CTTL-SPEAG,No.Z20-60421)<br>Feb-20(CTTL-SPEAG,No.Z20-60017)<br>Date(Calibrated by, Certificate No.)<br>Feb-20 (CTTL, No.J20X00516)<br>Feb-20 (CTTL, No.J20X00515) | Scheduled Calibra<br>May-21<br>May-21<br>Nov-21<br>Feb-21<br>Scheduled Calibra<br>Feb-21<br>Feb-21 | ation |
| All calibrations have been<br>humidity<70%.<br>Calibration Equipment used<br>Primary Standards<br>Power Meter NRP2<br>Power sensor NRP6A<br>ReferenceProbe EX3DV4<br>DAE4<br>Secondary Standards<br>Signal Generator E4438C<br>NetworkAnalyzer E5071C | rtificate.<br>conducted in t<br>(M&TE critical fo<br>ID #<br>106276<br>101369<br>SN 7600<br>SN 7600<br>SN 771<br>ID #<br>MY49071430<br>MY46110673<br>Name | ne clo<br>or calib<br>12-W<br>12-W<br>30-N<br>10-F<br>Cal I<br>25-F | osed laboratory facility: environment<br>oration)<br>Date(Calibrated by, Certificate No.)<br>May-20 (CTTL, No.J20X02965)<br>Mov-20(CTTL-SPEAG,No.Z20-60421)<br>eb-20(CTTL-SPEAG,No.Z20-60017)<br>Date(Calibrated by, Certificate No.)<br>Feb-20 (CTTL, No.J20X00516)<br>Feb-20 (CTTL, No.J20X00515)<br>Function                     | Scheduled Calibra<br>May-21<br>May-21<br>Nov-21<br>Feb-21<br>Scheduled Calibra<br>Feb-21<br>Feb-21 | ation |



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# lossary:

| TSL   | tissue simulating liquid       |
|-------|--------------------------------|
| ConvF | sensitivity in TSL / NORMx,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 assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

# Additional Documentation:

e) DASY4/5 System Handbook

## Methods Applied and Interpretation of Parameters:

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

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

Certificate No: Z21-60019

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## **Measurement Conditions**

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

| DASY Version                 | DASY52                   | V52.10.4    |
|------------------------------|--------------------------|-------------|
| Extrapolation                | Advanced Extrapolation   |             |
| Phantom                      | Triple Flat Phantom 5.1C |             |
| 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 | 40.1 ± 6 %   | 1.38 mlho/m ± 6 % |
| Head TSL temperature change during test | <1.0 °C         |              |                   |

### SAR result with Head TSL

| SAR averaged over 1 $cm^3$ (1 g) of Head TSL   | Condition          |                          |
|--|--------------------|--------------------------|
| SAR measured                                   | 250 mW input power | 9.85 W/kg                |
| SAR for nominal Head TSL parameters            | normalized to 1W   | 39.8 W/kg ± 18.8 % (k=2) |
| SAR averaged over 10 $cm^3$ (10 g) of Head TSL | Condition          |                          |
| SAR measured                                   | 250 mW input power | 5.05 W/kg                |
| SAR for nominal Head TSL parameters            | normalized to 1W   | 20.3 W/kg ± 18.7 % (k=2) |

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### Appendix (Additional assessments outside the scope of CNAS L0570)

#### Antenna Parameters with Head TSL

| Impedance, transformed to feed point | 53.5Ω+ 7.88jΩ |  |
|--------------------------------------|---------------|--|
| Return Loss                          | - 21.6dB      |  |

#### General Antenna Parameters and Design

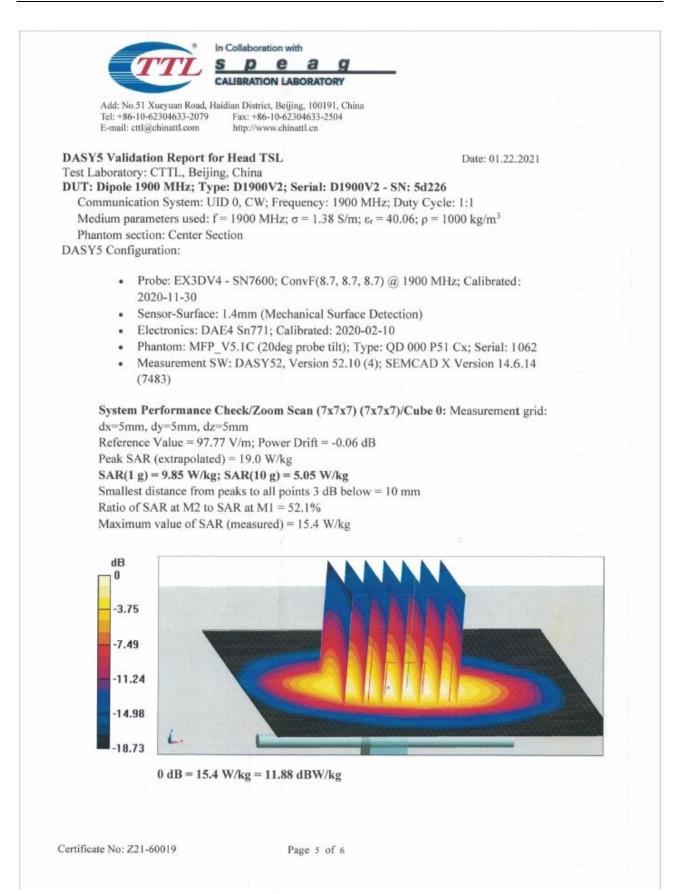
| Electrical Delay (one direction) | 1.102 ns |
|----------------------------------|----------|
|----------------------------------|----------|

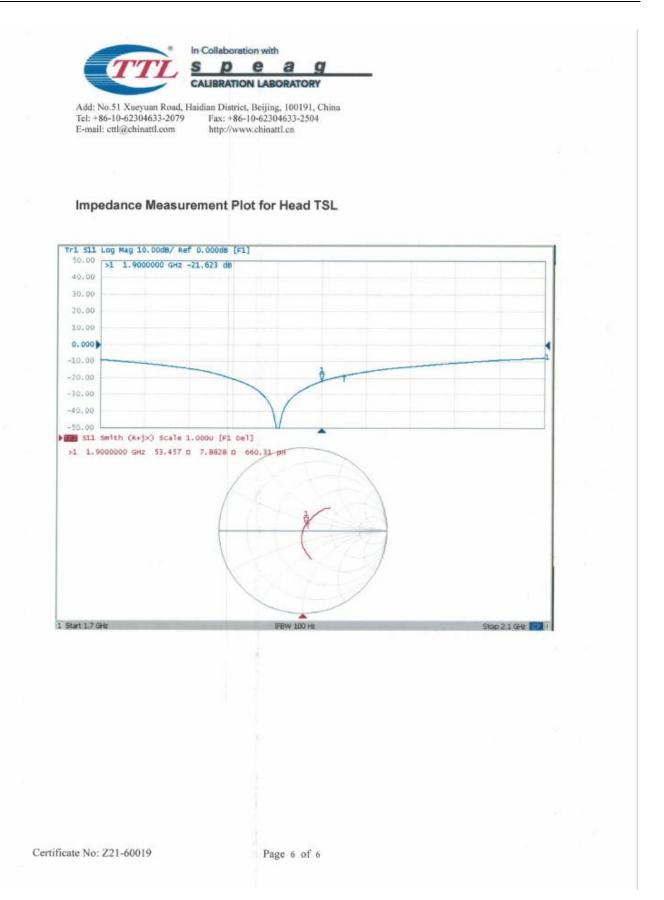
After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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 |  |
|---------------------|-------------|-------|--|
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| icate No: Z21-60019 | Page 4 of 6 |       |  |
|                     |             |       |  |





# 1.3. D2450V2 Dipole Calibration Certificate

|  | ILIBRATION<br>IAS L0570  |
|--|--------------------------|
| Client     HTW     Certificate No:     Z21-60020       CALIBRATION CERTIFICATE       Object     D2450V2 - SN: 1009       Calibration Procedure(s)     FF-Z11-003-01<br>Calibration Procedures for dipole validation kits   |                          |
| Deleter       D2450V2 - SN: 1009         Calibration Procedure(s)       FF-Z11-003-01         Calibration Procedures for dipole validation kits  |                          |
| Dbject     D2450V2 - SN: 1009       Calibration Procedure(s)     FF-Z11-003-01       Calibration Procedures for dipole validation kits   |                          |
| Calibration Procedure(s) FF-Z11-003-01<br>Calibration Procedures for dipole validation kits  |                          |
| Calibration Procedures for dipole validation kits  |                          |
| Calibration Procedures for dipole validation kits  |                          |
|  |                          |
| Calibration date: January 25, 2021   |                          |
|  |                          |
| This calibration Certificate documents the traceability to national standards, which realize the physica   | al units of              |
| This calibration Certificate documents the traceability to halional standards, which realize the physics   | following                |
| neasurements(SI). The measurements and the uncertainties with confidence probability are given on the  | tonowing                 |
| pages and are part of the certificate.   |                          |
|  | and and                  |
| All calibrations have been conducted in the closed laboratory facility: environment temperature(22   | ±3)°C and                |
| numidity<70%.  |                          |
|  |                          |
| Calibration Equipment used (M&TE critical for calibration)   |                          |
| Col Date(Colibrated by Certificate No.) Scheduled Ca   | alibration               |
| Primary Standards ID # Cal Date Calibrated by, Oct induct (Calibrated by, O |                          |
| May ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) (  |                          |
| Power Meter NRP2 106276 12-May-20 (CTTL, No.J20X02965) May-  |                          |
| Power Meter         NRP2         106276         12-May-20 (CTTL, No.J20X02965)         May-           Power sensor         NRP6A         101369         12-May-20 (CTTL, No.J20X02965)         May-  | And A                    |
| Power Meter         NRP2         106276         12-May-20 (CTTL, No.J20X02965)         May-           Power sensor         NRP6A         101369         12-May-20 (CTTL, No.J20X02965)         May-           ReferenceProbe         EX3DV4         SN 7600         30-Nov-20(CTTL-SPEAG,No.Z20-60421)         Nov   | 21                       |
| Power Meter         NRP2         106276         12-May-20 (CTTL, No.J20X02965)         May-           Power sensor         NRP6A         101369         12-May-20 (CTTL, No.J20X02965)         May-  | 21                       |
| Power Meter         NRP2         106276         12-May-20 (CTTL, No.J20X02965)         May-           Power sensor         NRP6A         101369         12-May-20 (CTTL, No.J20X02965)         May-           ReferenceProbe         EX3DV4         SN 7600         30-Nov-20 (CTTL-SPEAG, No.Z20-60421)         Nov           DAE4         SN 771         10-Feb-20 (CTTL-SPEAG, No.Z20-60017)         Feb-   |                          |
| Power Meter         NRP2         106276         12-May-20 (CTTL, No.J20X02965)         May-           Power sensor         NRP6A         101369         12-May-20 (CTTL, No.J20X02965)         May-           ReferenceProbe         EX3DV4         SN 7600         30-Nov-20 (CTTL-SPEAG,No.Z20-60421)         Nov           DAE4         SN 771         10-Feb-20 (CTTL-SPEAG,No.Z20-60017)         Feb-           Secondary Standards         ID #         Cal Date(Calibrated by, Certificate No.)         Scheduled C   | alibration               |
| Power Meter         NRP2         106276         12-May-20 (CTTL, No.J20X02965)         May-           Power sensor         NRP6A         101369         12-May-20 (CTTL, No.J20X02965)         May-           ReferenceProbe         EX3DV4         SN 7600         30-Nov-20(CTTL-SPEAG, No.Z20-60421)         Nov           DAE4         SN 771         10-Feb-20(CTTL-SPEAG, No.Z20-60017)         Feb-           Secondary Standards         ID #         Cal Date(Calibrated by, Certificate No.)         Scheduled C           Signal Generator E4438C         MY49071430         25-Feb-20 (CTTL, No.J20X00516)         Feb   | alibration<br>-21        |
| Power Meter         NRP2         106276         12-May-20 (CTTL, No.J20X02965)         May-           Power sensor         NRP6A         101369         12-May-20 (CTTL, No.J20X02965)         May-           ReferenceProbe         EX3DV4         SN 7600         30-Nov-20 (CTTL-SPEAG,No.Z20-60421)         Nov           DAE4         SN 771         10-Feb-20 (CTTL-SPEAG,No.Z20-60017)         Feb-           Secondary Standards         ID #         Cal Date(Calibrated by, Certificate No.)         Scheduled C           Signal Generator E4438C         MY49071430         25-Feb-20 (CTTL, No.J20X00516)         Feb   | alibration<br>-21        |
| Power Meter         NRP2         106276         12-May-20 (CTTL, No.J20X02965)         May-<br>May-<br>May-<br>Nay-<br>Nov           Power sensor         NRP6A         101369         12-May-20 (CTTL, No.J20X02965)         May-<br>May-<br>Nov           ReferenceProbe         EX3DV4         SN 7600         30-Nov-20(CTTL-SPEAG, No.Z20-60421)         Nov           DAE4         SN 771         10-Feb-20(CTTL-SPEAG, No.Z20-60017)         Feb-           Secondary Standards         ID #         Cal Date(Calibrated by, Certificate No.)         Scheduled C           Signal Generator E4438C         MY49071430         25-Feb-20 (CTTL, No.J20X00516)         Feb           NetworkAnalyzer E5071C         MY46110673         10-Feb-20 (CTTL, No.J20X00515)         Feb  | alibration<br>⊩21<br>⊢21 |
| Power MeterNRP210627612-May-20 (CTTL, No.J20X02965)May-Power sensorNRP6A10136912-May-20 (CTTL, No.J20X02965)May-ReferenceProbeEX3DV4SN 760030-Nov-20(CTTL-SPEAG, No.Z20-60421)NovDAE4SN 77110-Feb-20(CTTL-SPEAG, No.Z20-60017)Feb-Secondary StandardsID #Cal Date(Calibrated by, Certificate No.)Scheduled CSignal Generator E4438CMY4907143025-Feb-20 (CTTL, No.J20X00516)FebNetworkAnalyzer E5071CMY4611067310-Feb-20 (CTTL, No.J20X00515)FebNameFunctionSignatureMateFunctionSignatureMateFunctionSignatureMateStandardsSignatureNameFunctionSignatureStandardsStandardsStandardsNameFunctionStandards   | alibration<br>⊩21<br>⊢21 |
| Power Meter         NRP2         106276         12-May-20 (CTTL, No.J20X02965)         May-<br>May-<br>May-<br>Nay-<br>Nov           Power sensor         NRP6A         101369         12-May-20 (CTTL, No.J20X02965)         May-<br>May-<br>Nov           ReferenceProbe         EX3DV4         SN 7600         30-Nov-20(CTTL-SPEAG, No.Z20-60421)         Nov           DAE4         SN 771         10-Feb-20(CTTL-SPEAG, No.Z20-60017)         Feb-           Secondary Standards         ID #         Cal Date(Calibrated by, Certificate No.)         Scheduled C           Signal Generator E4438C         MY49071430         25-Feb-20 (CTTL, No.J20X00516)         Feb           NetworkAnalyzer E5071C         MY46110673         10-Feb-20 (CTTL, No.J20X00515)         Feb  | alibration<br>⊩21<br>⊢21 |
| Power MeterNRP210627612-May-20 (CTTL, No.J20X02965)May-Power sensorNRP6A10136912-May-20 (CTTL, No.J20X02965)May-ReferenceProbeEX3DV4SN 760030-Nov-20(CTTL-SPEAG, No.Z20-60421)NovDAE4SN 77110-Feb-20(CTTL-SPEAG, No.Z20-60017)Feb-Secondary StandardsID #Cal Date(Calibrated by, Certificate No.)Scheduled CSignal Generator E4438CMY4907143025-Feb-20 (CTTL, No.J20X00516)FebNetworkAnalyzer E5071CMY4611067310-Feb-20 (CTTL, No.J20X00515)FebCalibrated by:NameFunctionSignatuCalibrated by:Zhao JingSAR Test EngineerMay-   | alibration<br>⊩21<br>⊢21 |
| Power MeterNRP210627612-May-20 (CTTL, No.J20X02965)May-Power sensorNRP6A10136912-May-20 (CTTL, No.J20X02965)May-ReferenceProbeEX3DV4SN 760030-Nov-20(CTTL-SPEAG, No.Z20-60421)NovDAE4SN 77110-Feb-20(CTTL-SPEAG, No.Z20-60017)Feb-Secondary StandardsID #Cal Date(Calibrated by, Certificate No.)Scheduled CSignal Generator E4438CMY4907143025-Feb-20 (CTTL, No.J20X00516)FebNetworkAnalyzer E5071CMY4611067310-Feb-20 (CTTL, No.J20X00515)FebCalibrated by:NameFunctionSignaturCalibrated by:Zhao JingSAR Test EngineerSignatur  | alibration<br>⊩21<br>⊢21 |
| Power MeterNRP210627612-May-20 (CTTL, No.J20X02965)May-Power sensorNRP6A10136912-May-20 (CTTL, No.J20X02965)May-ReferenceProbeEX3DV4SN 760030-Nov-20(CTTL-SPEAG, No.Z20-60421)NovDAE4SN 77110-Feb-20(CTTL-SPEAG, No.Z20-60017)Feb-Secondary StandardsID #Cal Date(Calibrated by, Certificate No.)Scheduled CSignal Generator E4438CMY4907143025-Feb-20 (CTTL, No.J20X00516)FebNetworkAnalyzer E5071CMY4611067310-Feb-20 (CTTL, No.J20X00515)FebCalibrated by:NameFunctionSignatuCalibrated by:Zhao JingSAR Test EngineerMay-   | alibration<br>⊩21<br>⊢21 |
| Power MeterNRP210627612-May-20 (CTTL, No.J20X02965)May-Power sensorNRP6A10136912-May-20 (CTTL, No.J20X02965)May-ReferenceProbeEX3DV4SN 760030-Nov-20 (CTTL-SPEAG, No.Z20-60421)NovDAE4SN 77110-Feb-20 (CTTL-SPEAG, No.Z20-60017)Feb-Secondary StandardsID #Cal Date(Calibrated by, Certificate No.)Scheduled CSignal Generator E4438CMY4907143025-Feb-20 (CTTL, No.J20X00516)FebNetworkAnalyzer E5071CMY4611067310-Feb-20 (CTTL, No.J20X00515)FebCalibrated by:Zhao JingSAR Test EngineerSignatureReviewed by:Lin HaoSAR Test EngineerSar Sar Sar Sar Sar Sar Sar Sar Sar Sar  | alibration<br>⊩21<br>⊢21 |



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## Glossary:

| TSL   | tissue simulating liquid       |
|-------|--------------------------------|
| ConvF | sensitivity in TSL / NORMx,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 assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

## Additional Documentation:

e) DASY4/5 System Handbook

## Methods Applied and Interpretation of Parameters:

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

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

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 http://www.chinattl.cn

# Measurement Conditions

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

| DASY52                   | V52.10.4   |
|--------------------------|--|
| Advanced Extrapolation   |  |
| Triple Flat Phantom 5.1C |  |
| 10 mm                    | with Spacer  |
| dx, dy, dz = 5 mm        |  |
| 2450 MHz ± 1 MHz         |  |
|                          | Advanced Extrapolation<br>Triple Flat Phantom 5.1C<br>10 mm<br>dx, dy, dz = 5 mm |

## Head TSL parameters

The following parameters and calculations were applied.

|   | Temperature     | Permittivity | Conductivity     |
|---|-----------------|--------------|------------------|
| Nominal Head TSL parameters             | 22.0 °C         | 39.2         | 1.80 mho/m       |
| Measured Head TSL parameters            | (22.0 ± 0.2) °C | 39.5 ± 6 %   | 1.81 mho/m ± 6 % |
| Head TSL temperature change during test | <1.0 °C         |              | 0.000            |

## SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL   | Condition                           |                          |
|---|-------------------------------------|--------------------------|
| SAR measured  | 250 mW input power                  | 13.0 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W 52.0 W/kg ± 18.8 9 |                          |
| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | Condition                           |                          |
| SAR measured  | 250 mW input power                  | 5.97 W/kg                |
| SAR for nominal Head TSL parameters                     | normalized to 1W                    | 23.9 W/kg ± 18.7 % (k=2) |

