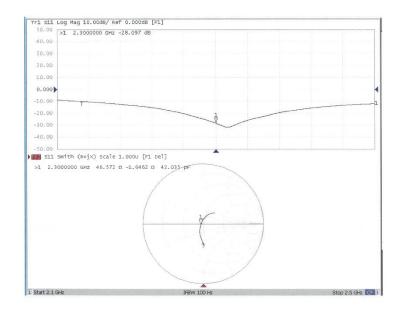






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Impedance Measurement Plot for Head TSL



Certificate No: 24J02Z000517

Page 6 of 6

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## Report No. : TESA2412000853EN Page: 32 of 56

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ccredited by the Swiss Accreditat he Swiss Accreditation Service lultilateral Agreement for the re	is one of the signatorie		Accreditation No.: SCS 0108
Client SGS Taoyuan City		Certificate No.	D2600V2-1005_Jan24
CALIBRATION C	ERTIFICATI	E	
Dbject	D2600V2 - SN:10	005	
Calibration procedure(s)	QA CAL-05.v12 Calibration Proce	edure for SAR Validation Sources	s between 0.7-3 GHz
Calibration date:	January 22, 2024	1	
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Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland



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

Accreditation No.: SCS 0108

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

#### Glossary: TSL

ConvF N/A

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

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

- a) IEC/IEEE 62209-1528, "Measurement Procedure For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body-Worn Wireless Communication Devices - Part 1528: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### Additional Documentation:

c) DASY 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 source is mounted in a touch configuration below the center marking of the flat phantom.
- . Return Loss: This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. 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: D2600V2-1005\_Jan24

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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	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz ± 1 MHz	

#### **Head TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.9 ± 6 %	2.02 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

#### SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	56.0 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL SAR measured	condition 250 mW input power	6.36 W/kg

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

#### Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.8 Ω - 3.4 jΩ	
Return Loss	- 28.8 dB	

#### General Antenna Parameters and Design

Electrical Delay (one direction)	1.153 ns
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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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Certificate No: D2600V2-1005\_Jan24

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## Report No. : TESA2412000853EN Page: 36 of 56

Date: 22.01.2024

#### DASY5 Validation Report for Head TSL

Test Laboratory: SPEAG, Zurich, Switzerland

#### DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1005

Communication System: UID 0 - CW; Frequency: 2600 MHz Medium parameters used: f = 2600 MHz;  $\sigma$  = 2.02 S/m;  $\epsilon_r$  = 37.9;  $\rho$  = 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(7.84, 7.84, 7.84) @ 2600 MHz; Calibrated: 03.11.2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 03.10.2023 •
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001 .
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

#### 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 = 116.7 V/m; Power Drift = 0.01 dB Peak SAR (extrapolated) = 28.4 W/kg SAR(1 g) = 14.3 W/kg; SAR(10 g) = 6.36 W/kgSmallest distance from peaks to all points 3 dB below = 8.9 mmRatio of SAR at M2 to SAR at M1 = 50.1%Maximum value of SAR (measured) = 23.4 W/kg



0 dB = 23.4 W/kg = 13.68 dBW/kg

Certificate No: D2600V2-1005\_Jan24

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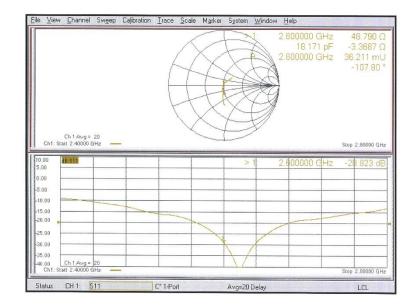
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Report No. : TESA2412000853EN Page: 37 of 56

#### Impedance Measurement Plot for Head TSL



Certificate No: D2600V2-1005\_Jan24

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Add: No.52 HuaYuanBei Rr. Tel: +86-10-62304633-2117 E-mail: cttl@chinattl.com	e a g ON LABORATORY Dad, Haidian District	Beijing, 100191	■国认可 国际互认 ZALIBRATION NAS L0570
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Object	D3500	V2 - SN: 1009	
Calibration Procedure(s)		1-003-01 ation Procedures for dipole validation kits	
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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) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020
- b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### **Additional Documentation:**

c) DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms 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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#### **Measurement Conditions**

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

DASY Version	DASY52	52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	3500 MHz ± 1 MHz	

#### **Head TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	37.9	2.91 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.0 ± 6 %	2.92 mho/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	100 mW input power	6.60 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	66.0 W/kg ± 24.4 % ( <i>k</i> =2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.58 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	25.8 W/kg ± 24.2 % (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	55.5Ω- 3.79jΩ	
Return Loss	- 24.0dB	

#### **General Antenna Parameters and Design**

Electrical Delay (one direction) 1.038 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point 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 feed-point may be damaged.

#### Additional EUT Data

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

Date: 2024-09-26

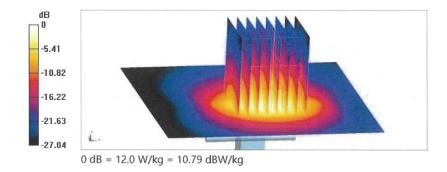
Test Laboratory: CTTL, Beijing, China DUT: Dipole 3500 MHz; Type: D3500V2; Serial: D3500V2 - SN: 1009 Communication System: UID 0, CW; Frequency: 3500 MHz Medium parameters used: f = 3500 MHz;  $\sigma$  = 2.923 S/m;  $\epsilon_r$  = 38.02;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Right Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007) **DASY5** Configuration:

- Probe: EX3DV4 SN7464; ConvF(6.73, 6.82, 6.94) @ 3500 MHz; Calibrated: 2024-01-22
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2024-01-03
- Phantom: MFP\_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

#### Dipole Calibration /Pin=100mW, d=10mm, f=3500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 53.08 V/m; Power Drift = 0.02 dB Peak SAR (extrapolated) = 16.2 W/kg SAR(1 g) = 6.6 W/kg; SAR(10 g) = 2.58 W/kg Smallest distance from peaks to all points 3 dB below = 8.2 mm Ratio of SAR at M2 to SAR at M1 = 77.6%

Maximum value of SAR (measured) = 12.0 W/kg



Certificate No: 24J02Z000793

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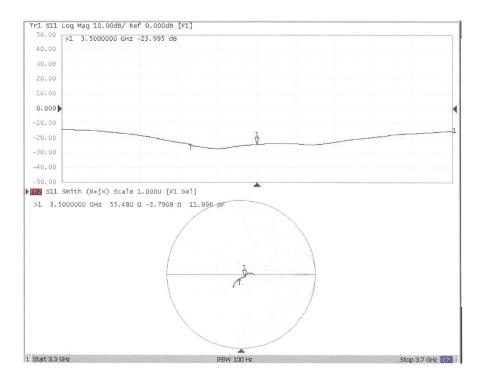
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Impedance Measurement Plot for Head TSL



Certificate No: 24J02Z000793

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Add: No.52 Hua YuanBei R. Tel: +86-10-62304633-2117 E-mail: emf@eaict.ac.en Client SGS	e a g	Beijing, 100191	国认可 际互认 LIBRATION AS L0570
CALIBRATION C	ERTIFICAT		
Object	D3700	V2 - SN: 1057	
Calibration Procedure(s)		I-003-01 tition Procedures for dipole validation kits	
Calibration date:	Novem	nber 21, 2024	
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Certificate No: 24J02Z000932

Page 1 of 6

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#### Glossary:

TSL ConvF N/A

tissue simulating liquid sensitivity in TSL / NORMx,y,z not applicable or not measured

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

a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and

- Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020
- b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### Additional Documentation:

c) DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms 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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#### Measurement Conditions

DASY Version	DASY52	52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	3700 MHz ± 1 MHz	

#### Head TSL parameters at 3700 MHz

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	37.7	3.12 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.9 ± 6 %	3.03 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C		

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#### SAR result with Head TSL at 3700 MHz

SAR averaged over 1 $cm^3$ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.74 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	67.5 W/kg ± 24.4 % (k=2)
SAR averaged over 10 $cm^3$ (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.46 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.5 W/kg ± 24.2 % (k=2)

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

#### Antenna Parameters with Head TSL at 3700 MHz

Impedance, transformed to feed point	51.5Ω+ 3.52jΩ	
Return Loss	- 28.5dB	

#### **General Antenna Parameters and Design**

Electrical Delay (one direction)	1.042 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point 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 feed-point may be damaged. connections near the feed-point may be damaged.

#### Additional EUT Data

Manufactured by	SPEAG
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## Report No. : TESA2412000853EN Page: 48 of 56





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

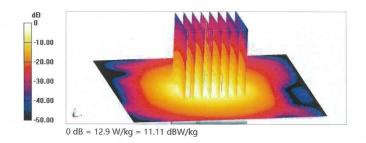
Date: 2024-11-21

Test Laboratory: CTTL, Beijing, China DUT: Dipole 3700 MHz; Type: D3700V2; Serial: D3700V2 - SN: 1057 Communication System: UID 0, CW; Frequency: 3700 MHz; Medium parameters used: f = 3700 MHz;  $\sigma$  = 3.032 S/m;  $\epsilon$ r = 36.89;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Right Section

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

- Probe: EX3DV4 SN7517; ConvF(6.56, 6.56, 6.56) @ 3700 MHz; Calibrated: 2024-02-21
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1588; Calibrated: 2024-09-13
- Phantom: MFP\_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: .
- 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration /Pin=100mW, d=10mm, f=3700 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 69.51 V/m; Power Drift = -0.05 dB Peak SAR (extrapolated) = 18.1 W/kg SAR(1 g) = 6.74 W/kg; SAR(10 g) = 2.46 W/kg Smallest distance from peaks to all points 3 dB below = 8 mm Ratio of SAR at M2 to SAR at M1 = 75.4% Maximum value of SAR (measured) = 12.9 W/kg



Certificate No: 24J02Z000932

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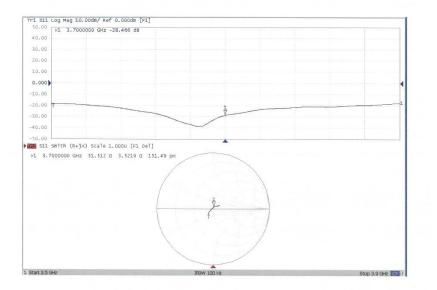
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#### Impedance Measurement Plot for Head TSL



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	Add: No.52 HuaYuanBei Ro Tel: +86-10-62304633-2117 E-mail: emf@caict.ac.cn	e a g	t, Beijing, 100191	間认可 振 互 认 ALIBRATION VAS L0570 4J02Z0000933
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		2000		
Ca	alibration Procedure(s)	FF-Z	11-003-01	
		Calib	ration Procedures for dipole validation kits	
Ca	alibration date:	Nove	mber 22, 2024	
	II calibrations have been umidity<70%.	conducted in	the closed laboratory facility: environment	temperature (22+3)°C and
Ca	alibration Equipment used	I (M&TE critical	for calibration)	
Pr	alibration Equipment used rimary Standards Power Meter NRP2	I (M&TE critical ID # 106276	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Pr	rimary Standards	ID #		
Pr F F F	rimary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4	ID # 106276 101369 SN 7517	Cal Date (Calibrated by, Certificate No.) 17-May-24 (CTTL, No. J24X04107)	Scheduled Calibration May-25
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Pr F F F C	rimary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4	ID # 106276 101369 SN 7517	Cal Date (Calibrated by, Certificate No.) 17-May-24 (CTTL, No. J24X04107) 17-May-24 (CTTL, No. J24X04107) 21-Feb-24(CTTL-SPEAG, No. 24J02280008)	Scheduled Calibration May-25 May-25 Feb-25
Pr F F C S	rimary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4	ID # 106276 101369 SN 7517 SN 1588	Cal Date (Calibrated by, Certificate No.) 17-May-24 (CTTL, No. J24X04107) 17-May-24 (CTTL, No. J24X04107) 21-Feb-24(CTTL-SPEAG, No. 24J02Z80008) 13-Sep-24(CTTL-SPEAG, No. 24J02Z000713) Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration May-25 May-25 Feb-25 Sep-25
Pr F F C S S	rimary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C	ID # 106276 101369 SN 7517 SN 1588 ID # MY49071430 MY46110673	Cal Date (Calibrated by, Certificate No.) 17-May-24 (CTTL, No. J24X04107) 17-May-24 (CTTL, No. J24X04107) 21-Feb-24(CTTL-SPEAG, No. 24J02280008) 13-Sep-24(CTTL-SPEAG, No. 24J022000713) Cal Date (Calibrated by, Certificate No.) 25-Dec-23 (CTTL, No. J23X13426) 25-Dec-23 (CTTL, No. J23X13425)	Scheduled Calibration May-25 May-25 Feb-25 Sep-25 Scheduled Calibration Dec-24 Dec-24
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Pr F F C S S O	rimary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C	ID # 106276 101369 SN 7517 SN 1588 ID # MY49071430 MY46110673 1040	Cal Date (Calibrated by, Certificate No.) 17-May-24 (CTTL, No. J24X04107) 17-May-24 (CTTL, No. J24X04107) 21-Feb-24(CTTL-SPEAG, No. 24J02280008) 13-Sep-24(CTTL-SPEAG, No. 24J022000713) Cal Date (Calibrated by, Certificate No.) 25-Dec-23 (CTTL, No. J23X13426) 25-Dec-23 (CTTL, No. J23X13425) 22-Jan-24(SPEAG, No.OCP-DAK3.5-1040_Jan24)	Scheduled Calibration May-25 May-25 Feb-25 Sep-25 Scheduled Calibration Dec-24 Dec-24
Pr F F S S S C	rimary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C DCP DAK-3.5(weighted)	ID # 106276 101369 SN 7517 SN 1588 ID # MY49071430 MY46110673 1040 Name	Cal Date (Calibrated by, Certificate No.)   17-May-24 (CTTL, No. J24X04107)   17-May-24 (CTTL, No. J24X04107)   21-Feb-24(CTTL-SPEAG, No. 24J02280008)   13-Sep-24(CTTL-SPEAG, No. 24J0228000713)   Cal Date (Calibrated by, Certificate No.)   25-Dec-23 (CTTL, No. J23X13426)   25-Dec-23 (CTTL, No. J23X13425)   22-Jan-24(SPEAG, No.OCP-DAK3.5-1040_Jan24)   Function	Scheduled Calibration May-25 May-25 Feb-25 Sep-25 Scheduled Calibration Dec-24 Dec-24 Dec-24 ) Jan-25

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#### Glossary:

TSL ConvF N/A

tissue simulating liquid sensitivity in TSL / NORMx,y,z not applicable or not measured

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

- a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and
- Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020
- b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

#### Additional Documentation:

c) DASY4/5 System Handbook

#### Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms 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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#### **Measurement Conditions**

DASY Version	DASY52	52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	3900 MHz ± 1 MHz 4100 MHz ± 1 MHz	

Head TSL parameters at 3900MHz

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	37.5	3.32 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.4 ± 6 %	3.35 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C		

SAR averaged over 1 $cm^3$ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.70 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	66.9 W/kg ± 24.4 % (k=2)
SAR averaged over 10 $cm^3$ (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.32 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.2 W/kg ± 24.2 % (k=2)

#### Head TSL parameters at 4100MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	37.2	3.53 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.9 ± 6 %	3.54 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C		

SAR result with Head TSL at 4100MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.81 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	67.9 W/kg ± 24.4 % (k=2)
SAR averaged over 10 $cm^3$ (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.3 W/kg ± 24.2 % (k=2)

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

#### Antenna Parameters with Head TSL at 3900MHz

Impedance, transformed to feed point	46.1Ω- 5.60jΩ
Return Loss	- 23.0dB

#### Antenna Parameters with Head TSL at 4100MHz

Impedance, transformed to feed point	59.3Ω+ 1.21jΩ
Return Loss	- 21.3dB

#### General Antenna Parameters and Design

Electrical Delay (one direction)	1.011 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point 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 feed-point may be damaged.

#### Additional EUT Data

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# SI

## Report No. : TESA2412000853EN Page: 54 of 56





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#### **DASY5 Validation Report for Head TSL** Test Laboratory: CTTL, Beijing, China

Date: 2024-11-22

DUT: Dipole 3900 MHz; Type: D3900V2; Serial: D3900V2 - SN: 1032 Communication System: UID 0, CW; Frequency: 3900 MHz; Frequency: 4100 MHz; Medium parameters used: f = 3900 MHz;  $\sigma$  = 3.35 S/m;  $\varepsilon_r$  = 37.39;  $\rho$  = 1000 kg/m<sup>3</sup> Medium parameters used: f = 4100 MHz;  $\sigma$  = 3.54 S/m;  $\epsilon$ r = 36.87;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Right Section

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

- Probe: EX3DV4 SN7517; ConvF(6.4, 6.4, 6.4) @ 3900 MHz; ConvF(6.43, 6.43, 6.43) @ 4100 MHz; Calibrated: 2024-02-21
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1588; Calibrated: 2024-09-13
- Phantom: MFP\_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: . 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501) .

Dipole Calibration /Pin=100mW, d=10mm, f=3900 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 66.32 V/m; Power Drift = -0.07 dB Peak SAR (extrapolated) = 19.3 W/kg SAR(1 g) = 6.7 W/kg; SAR(10 g) = 2.32 W/kg Smallest distance from peaks to all points 3 dB below = 7.6 mm Ratio of SAR at M2 to SAR at M1 = 73.3% Maximum value of SAR (measured) = 13.2 W/kg

Dipole Calibration /Pin=100mW, d=10mm, f=4100 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 65.43 V/m; Power Drift = -0.08 dB Peak SAR (extrapolated) = 20.6 W/kg SAR(1 g) = 6.81 W/kg; SAR(10 g) = 2.33 W/kg Smallest distance from peaks to all points 3 dB below = 7.9 mm Ratio of SAR at M2 to SAR at M1 = 72.1% Maximum value of SAR (measured) = 13.8 W/kg

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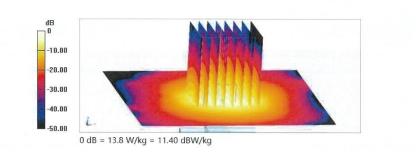




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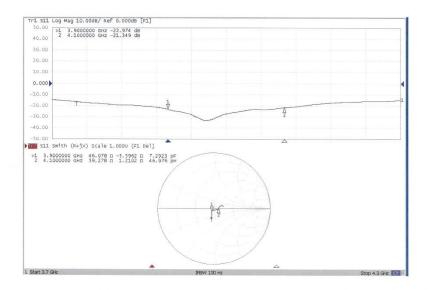
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Impedance Measurement Plot for Head TSL



Certificate No: 24J02Z000933

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## - End of report -

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