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1.	CALIB	<b>P C A G</b> RATION LABORATORY			国际互认
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E-mail: cttl@chi	nattl.com htt	dian District, Beijing, 100191, Cl x: +86-10-62304633-2504 p://www.chinattl.cn	The Anderson and the		CALIBRATION CNAS L0570
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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

Appendix C

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- 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: Z21-60550

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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	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	1

## **Head TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	42.0	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.1 ± 6 %	0.90 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	250 mW input power	2.17 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.54 W/kg ± 18.8 % ( <i>k</i> =2)
SAR averaged over 10 $cm^3$ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.43 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.65 W/kg ± 18.7 % ( <i>k</i> =2)



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

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## Antenna Parameters with Head TSL

Impedance, transformed to feed point	55.0Ω+ 0.78jΩ
Return Loss	- 26.4dB

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## General Antenna Parameters and Design

Electrical Delay (one direction)	
Lioundar Belay (one direction)	0.942 ns
	0.042 113

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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**DASY5 Validation Report for Head TSL** 

Test Laboratory: CTTL, Beijing, China

Date: 2021-12-15

**DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1099** Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1 Medium parameters used: f = 750 MHz;  $\sigma = 0.904$  S/m;  $\varepsilon_r = 41.1$ ;  $\rho = 1000$  kg/m<sup>3</sup> Phantom section: Right Section

Appendix C

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

- Probe: EX3DV4 SN7307; ConvF(10.31, 10.31, 10.31) @ 750 MHz; Calibrated: 2021-05-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15
- 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/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

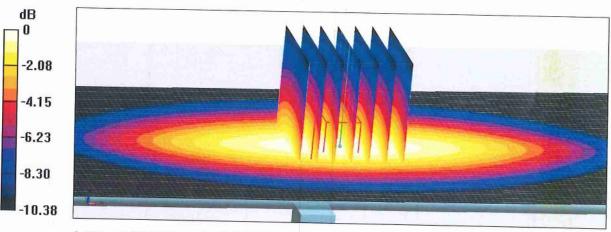
Reference Value = 56.18 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.25 W/kg

SAR(1 g) = 2.17 W/kg; SAR(10 g) = 1.43 W/kg

Smallest distance from peaks to all points 3 dB below: Larger than measurement grid (> 15 mm)

Ratio of SAR at M2 to SAR at M1 = 66.5%Maximum value of SAR (measured) = 2.89 W/kg



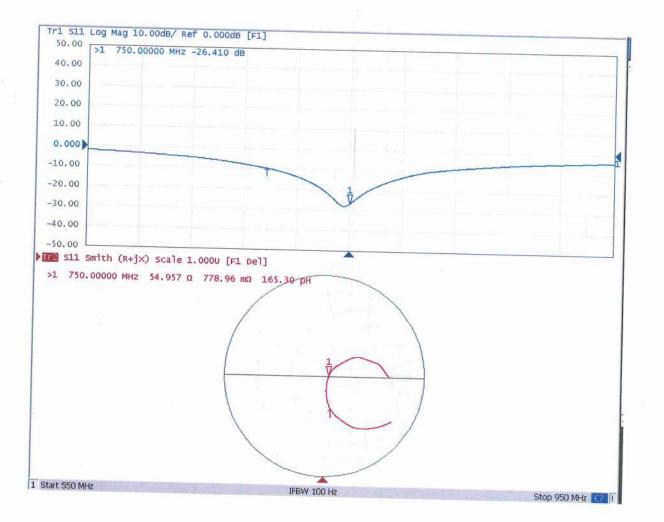
0 dB = 2.89 W/kg = 4.61 dBW/kg

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# Impedance Measurement Plot for Head TSL



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# D750V3, Serial No. 1099 Extended Dipole Calibrations

If dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

			D750V3 – serial no. 109	9		
			750	Head		
Date of	Return-Loss	Delta	Real Impedance	Delta	Imaginary Impedance	Delta
Measurement	(dB)	(%)	(ohm)	(ohm)	(ohm)	(ohm)
2021.12.15	-26.4		55		0.78	
2022.12.14	-26.6	0.9%	54.6	0.4	1.6	-0.82
2023.12.14	-26.2	-0.9%	55.04	-0.04	-1.15	1.93

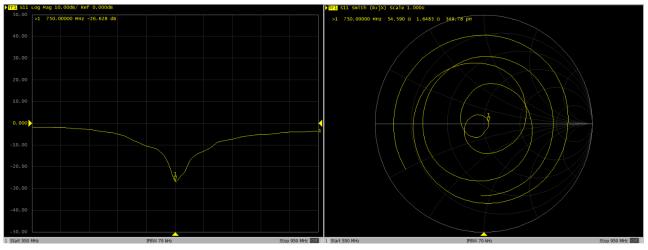
#### <Justification of the extended calibration>

The return loss is < -20dB, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.



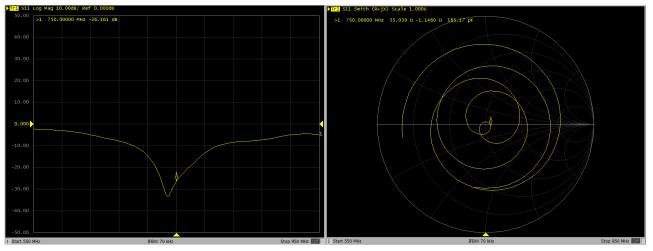
#### Dipole Verification Data> D750V3, serial no. 1099

#### 750MHz - Head----2022.12.14



#### 750MHz - Head----2023.12.14

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Add: No.52 Hua YuanBei Road, Hi         Tel: +86-10-62304633-2079         E-mail: cttl@chinattl.com         Client       Sporton         CALIBRATION CERTIFIC         Object       Date         Calibration Procedure(s)       FF         Calibration date:       De         This calibration Certificate documents measurements (SI). The measurements pages and are part of the certificate.         All calibrations have been conducted humidity<70%.	Fax: +86-10 http://www. CATE 835V2 - S =-Z11-003- alibration F ecember 1 the trace s and the t in the cl ical for cali	100191, Chi         Certificate No:         Z         es for dipole validation kits         national standards, which reies with confidence probability	CALIBRATION CNAS L0570 221-60551 Palize the physical units of y are given on the following temperature (22±3)°C and Scheduled Calibration Sep-22
Add: No.52 Hua YuanBei Road, Hi Tel: +86-10-62304633-2079         Client       Sporton         Client       Sporton         CALIBRATION CERTIFIC         Object       Date         Calibration Procedure(s)       Ff         Calibration Procedure(s)       Ff         Calibration date:       De         This calibration Certificate documents measurements (SI). The measurements pages and are part of the certificate.         All calibrations have been conducted humidity<70%.	ALIBRATION Haidian Distri Fax: +86-10 http://www. CATE 835V2 - S F-Z11-003 alibration F ecember 1 the trace s and the u in the cl ical for cali	Tony         100191, Chi         Certificate No:         Z         es for dipole validation kits         national standards, which relies with confidence probability         oratory facility: environment         alibrated by, Certificate No.)         TTL, No.J21X08326)	国际互认 校准 CALIBRATION CNAS L0570 Z21-60551 ealize the physical units of y are given on the following temperature (22±3)℃ and Scheduled Calibration Sep-22
Add: No.52 HuaYuanBei Road, Hi         Tel: +86-10-62304633-2079         E-mail: cttl@chinattl.com         Client       Sporton         CALIBRATION CERTIFIC         Object       Date         Calibration Procedure(s)       FF         Calibration date:       Det         This calibration Certificate documents       Det         This calibration Certificate documents       Det         All calibrations have been conducted numidity<70%.	Iaidian Distri Fax: +86-10 http://www. CATE 835V2 - Si 5-Z11-003 alibration F ecember 1 the trace s and the u in the cl ical for cali	100191, Chi         2504         Certificate No:         Z         es for dipole validation kits         national standards, which relies with confidence probability         oratory facility: environment         alibrated by, Certificate No.)         TTL, No.J21X08326)	校准 CALIBRATION CNAS L0570 221-60551 Palize the physical units of y are given on the following temperature (22±3)℃ and Scheduled Calibration Sep-22
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Primary Standards       ID #         Power Meter       NRP2       106277         Power sensor       NRP8S       104291         Reference Probe EX3DV4       SN 7307         DAE4       SN 1556         Secondary Standards       ID #         Signal Generator E4438C       MY490714         NetworkAnalyzer E5071C       MY461106         Name       Zhao Jing	Cal 24-5	TTL, No.J21X08326)	Sep-22
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Power MeterNRP2106277Power sensorNRP8S104291Reference Probe EX3DV4SN 7307DAE4SN 1556Secondary StandardsID #Signal Generator E4438CMY490714NetworkAnalyzer E5071CMY461106NameIbrated by:Zhao Jing	24-5	TTL, No.J21X08326)	Sep-22
Power sensor NRP8S Reference Probe EX3DV4 DAE4 Signal Generator E4438C NetworkAnalyzer E5071C Name alibrated by: Name	24-5	TTL, No.J21X08326)	Sep-22
Reference Probe EX3DV4       SN 7307         DAE4       SN 1556         Secondary Standards       ID #         Signal Generator E4438C       MY490714         NetworkAnalyzer E5071C       MY461106         Name       Zhao Jing	24-5	TTI No 121X08226	
DAE4 SN 1556 Secondary Standards ID # Signal Generator E4438C MY490714 NetworkAnalyzer E5071C MY461106 Name Alibrated by: Zhao Jing		(10.02 1A00320)	Sep-22
Secondary Standards ID # Signal Generator E4438C MY490714 NetworkAnalyzer E5071C MY461106 Name Alibrated by: Zhao Jing	26-N	PEAG,No.EX3-7307_May21)	May-22
Signal Generator E4438C       MY490714         NetworkAnalyzer E5071C       MY461106         Name       Name         alibrated by:       Zhao Jing		EAG,No.DAE4-1556_Jan21)	Jan-22
NetworkAnalyzer E5071C MY461106 Name Alibrated by: Zhao Jing	Cal I	ibrated by, Certificate No.)	Scheduled Calibration
alibrated by: Zhao Jing	430 01-F	TTL, No.J21X00593)	Jan-22
alibrated by: Zhao Jing	373 14-J	TTL, No.J21X00232)	Jan-22
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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

Appendix C

- 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: Z21-60551



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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	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

## **Head TSL parameters**

The following parameters and calculations were applied.

Temperature	Permittivity	Conductivity
22.0 °C	41.5	0.90 mho/m
(22.0 ± 0.2) °C	40.8 ± 6 %	0.91 mho/m ± 6 %
<1.0 °C		
	22.0 °C (22.0 ± 0.2) °C	22.0 °C         41.5           (22.0 ± 0.2) °C         40.8 ± 6 %

# SAR result with Head TSL

SAR averaged over 1 $cm^3$ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.44 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.64 W/kg ± 18.8 % (k=2)
SAR averaged over 10 $cm^3$ (10 g) of Head TSL	Condition	<u> </u>
SAR measured	250 mW input power	1.58 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.26 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	53.7Ω- 2.20jΩ	٦
Return Loss	- 27.7dB	-

# General Antenna Parameters and Design

Electrical Delay (one direction)	1246 mg
	1.346 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	
ate No: 721 60551		



**DASY5 Validation Report for Head TSL** 

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Date: 2021-12-17

Test Laboratory: CTTL, Beijing, China **DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d162** Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1 Medium parameters used: f = 835 MHz;  $\sigma = 0.91$  S/m;  $\varepsilon_r = 40.77$ ;  $\rho = 1000$  kg/m<sup>3</sup> Phantom section: Right Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 SN7307; ConvF(10.13, 10.13, 10.13) @ 835 MHz; Calibrated: 2021-05-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15
- 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/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 59.81 V/m; Power Drift = -0.01 dB

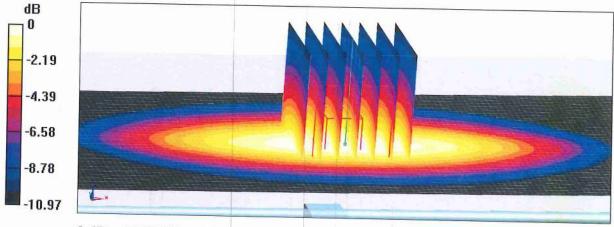
Peak SAR (extrapolated) = 3.70 W/kg

SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.58 W/kg

Smallest distance from peaks to all points 3 dB below = 20.5 mm

Ratio of SAR at M2 to SAR at M1 = 65.7%

Maximum value of SAR (measured) = 3.28 W/kg



0 dB = 3.28 W/kg = 5.16 dBW/kg

Page 5 of 6



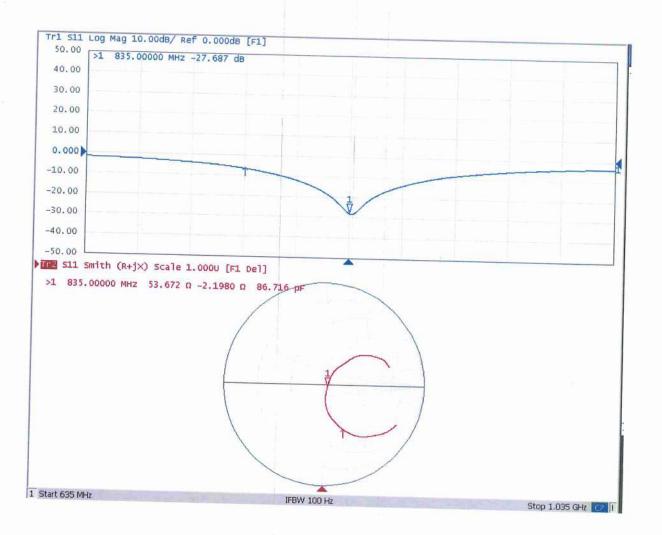
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D

# Impedance Measurement Plot for Head TSL





# D835V2, Serial No. 4d162 Extended Dipole Calibrations

If dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

D835V2 – serial no. 4d162						
		835 Head				
Date of	Return-Loss	Return-Loss Delta Real Impedance Delta Imaginary Impedance Delta				
Measurement	(dB)	(%)	(ohm)	(ohm)	(ohm)	(ohm)
2021.12.17	-27.7		53.7		-2.2	
2022.12.16	-27.7	0.0%	52.2	1.5	-3.6	1.4
2023.12.16	-27.9	0.7%	53.3	0.4	-2.5	0.3

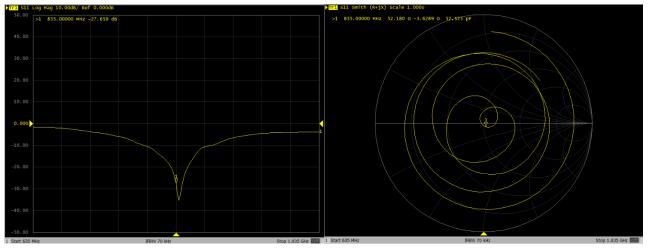
#### <Justification of the extended calibration>

The return loss is < -20dB, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

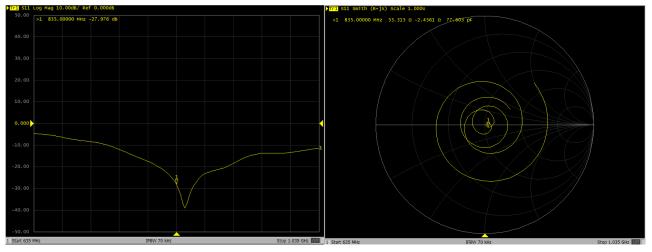


#### Dipole Verification Data> 835V2, serial no. 4d162

#### 835MHz - Head----2022.12.16



#### 835MHz - Head----2023.12.16



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Client sportor	n	Certificate No:	Z21-60374
CALIBRATION CE	RTIFICAT	Έ	
Object	D1750\	/2 - SN: 1137	
Calibration Procedure(s)	FF-Z11- Calibrat	-003-01 tion Procedures for dipole validation k	tits
Calibration date:	Octobe	r 19, 2021	
	asurements and	traceability to national standards, whe uncertainties with confidence pro	
All calibrations have been humidity<70%.	conducted in t	he closed laboratory facility: enviro	nment temperature (22±3)°C and
Calibration Equipment used	(M&TE critical fo	or calibration)	
Primary Standards	ID #	Cal Date (Calibrated by, Certificate	No.) Scheduled Calibration
Power Meter NRP2	106277	24-Sep-21 (CTTL, No.J21X08326)	Sep-22
Power sensor NRP8S	104291	24-Sep-21 (CTTL, No.J21X08326)	Sep-22
Reference Probe EX3DV4	SN 7517	03-Feb-21(CTTL-SPEAG,No.Z21-6	0001) Feb-22
DAE4	SN 1556	15-Jan-21(SPEAG,No.DAE4-1556_	Jan21) Jan-22
Secondary Standards	ID#	Cal Date (Calibrated by, Certificate	No.) Scheduled Calibration
Signal Generator E4438C	MY49071430	01-Feb-21 (CTTL, No.J21X00593)	Jan-22
NetworkAnalyzer E5071C	MY46110673	14-Jan-21 (CTTL, No.J21X00232)	Jan-22
	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	EE.
Reviewed by:	Lin Hao	SAR Test Engineer	AT 35
Approved by:	Qi Dianyuan	SAR Project Leader	and
		Issue	d: October 24 2021
This calibration certificate sh	all not be repro	duced except in full without written ap	proval of the laboratory.



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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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#### 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	1750 MHz ± 1 MHz	

#### **Head TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.8 ± 6 %	1.38 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	250 mW input power	9.20 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	36.5 W/kg ± 18.8 % (k=2)
SAR averaged over 10 $cm^3$ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	4.83 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.2 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	51.8Ω+ 0.34jΩ	
Return Loss	- 34.9 dB	

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

Electrical Delay (one direction)	1.123 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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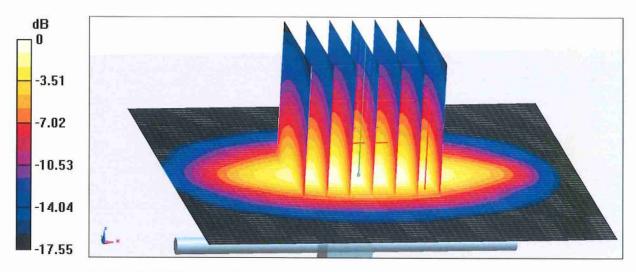
 E-mail: cttl@chinattl.com
 http://www.chinattl.cn

DASY5 Validation Report for Head TSLDate: 10.19.2021Test Laboratory: CTTL, Beijing, ChinaDUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1137Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1Medium parameters used: f = 1750 MHz;  $\sigma = 1.382$  S/m;  $\epsilon_r = 39.76$ ;  $\rho = 1000$  kg/m<sup>3</sup>Phantom section: Right SectionDASY5 Configuration:

Probe: EX3DV4 - SN7517; ConvF(8.22, 8.22, 8.22) @ 1750 MHz; Calibrated: 2021-02-03

- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15
- Phantom: MFP\_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7501)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 97.97 V/m; Power Drift = -0.01 dB Peak SAR (extrapolated) = 17.3 W/kg SAR(1 g) = 9.2 W/kg; SAR(10 g) = 4.83 W/kg Smallest distance from peaks to all points 3 dB below = 10 mm Ratio of SAR at M2 to SAR at M1 = 53.1% Maximum value of SAR (measured) = 14.3 W/kg



0 dB = 14.3 W/kg = 11.55 dBW/kg

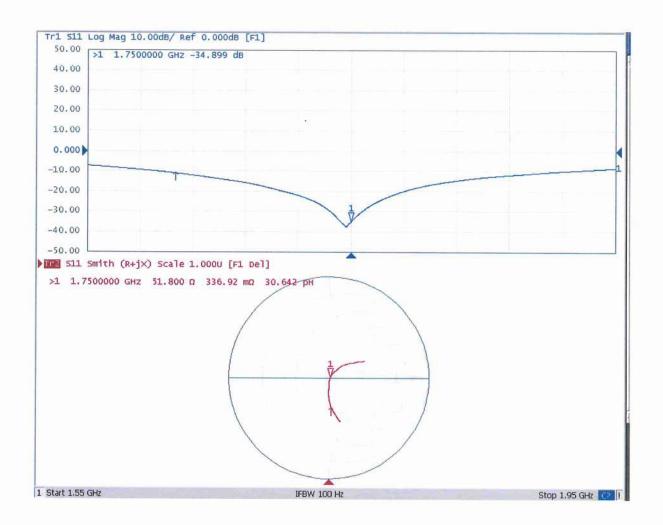




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#### Impedance Measurement Plot for Head TSL





# D1750V2, Serial No. 1137 Extended Dipole Calibrations

if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

D1750V2 – serial no. 1137							
		1750 Head					
Date of	Return-Loss	Delta	Real Impedance	Delta	Imaginary Impedance	Delta	
Measurement	(dB)	(%)	(ohm)	(ohm)	(ohm)	(ohm)	
2021.10.19	-34.9		51.8		0.34		
2022.10.18	-40.4	15.8%	50.9	0.7	0.15	0.19	
2023.10.18	-35.7	2.0%	48.8	3	-1.1	1.44	

#### <Justification of the extended calibration>

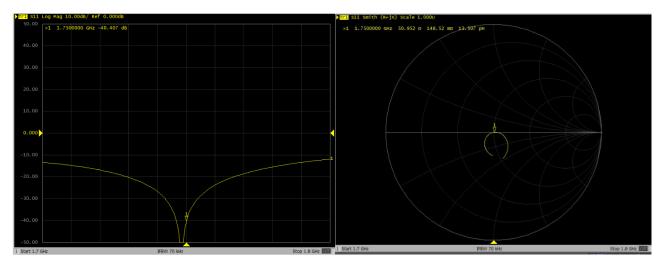
The return loss is < -20dB, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.



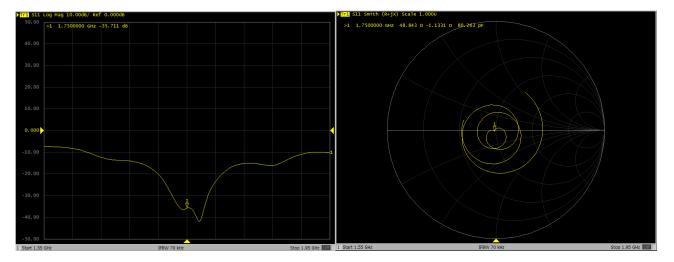


#### Dipole Verification Data> D1750V2, serial no. 1137

#### 1750MHz - Head----2022.10.18



#### 1750MHz - Head----2023.10.18



			Appendix C		Rep	ort No. : FA49191
Add: No. 52 Hugy		<b>D</b>	e a g	Hac-MRA	CNAS	中国认可 国际互认 校准
Tel: +86-10-6230 E-mail: cttl@chin	4633-2079 Fax	: +86-1	ict, Beijing, 100191 0-62304633-2504 .chinattl.cn	Chi The Andrew		CALIBRATION CNAS L0570
Client Sp	orton			Certificate No:	Z21-60553	
CALIBRATION C	ERTIFICA	TE	115 10	California (	Serie Min	1
Object	D190	0V2 -	SN: 5d182			
Calibration Procedure(s)	EE 7	11-003	01			
E.				dipole validation kits		
Calibration date:						
	Decei	nper 2	20, 2021			
This calibration Certificate measurements (SI). The measurements and are part of the c	easurements ar	e trace d the	ability to nation uncertainties wi	nal standards, which th confidence probal	n realize the phy pility are given on	sical units of the following
All calibrations have been humidity<70%.	conducted in	the c	losed laborator	y facility: environm	ent temperature	(22±3)°C and
Calibration Equipment used	I (M&TE critical	for ca	libration)		<u>a</u>	
Primary Standards	ID #	Ca	l Date (Calibrat	ed by, Certificate No	.) Scheduled	Calibration
Power Meter NRP2	106277			No.J21X08326)		ep-22
Power sensor NRP8S	104291			No.J21X08326)	Se	p-22
Reference Probe EX3DV4		26-	May-21(SPEAG	No.EX3-7307_May	21) M	ay-22
DAE4	SN 1556	15-,	Jan-21(SPEAG,	No.DAE4-1556_Jan	120 (121) (12)	in-22
Secondary Standards	ID#	Cal	Date (Calibrate	d by, Certificate No.	Cohodulad	0-11-11
Signal Generator E4438C	MY49071430		eb-21 (CTTL, I			Calibration
NetworkAnalyzer E5071C	MY46110673		Jan-21 (CTTL, N			an-22 an-22
	Name		Function			
Calibrated by:	Zhao Jing		SAR Test Eng	ineer	Signat	ure
			OAN lest Ling	ineer	The second	< .s
Reviewed by:	Lin Hao		SAR Test Eng	ineer	the star	6
Approved by:	Qi Dianyuan		SAR Project L	.eader	21	ren letter
					Ale.	
This calibration certificate sh	all not be reprov	duced	except in full w	Issued: D	ecember 27, 2021	
		auceu	except in full W	anout written approv	al of the laborator	у.
				A.		
Certificate No: Z21-60553			Page 1 of 6			
			and a second			



Appendix C In Collaboration with

S D C ALIBRATION LABORATORY

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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: Z21-60553

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<u>Appendix C</u>

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S

### **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	39.4 ± 6 %	1.41 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	250 mW input power	10.0 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	39.6 W/kg ± 18.8 % (k=2)
SAR averaged over 10 $cm^3$ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.07 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	20.2 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	54.3Ω+ 6.57ϳΩ	
Return Loss	- 22.5dB	

# General Antenna Parameters and Design

Electrical Delay (one direction)	1.112 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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CALIBRATION LABORATORY

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

Date: 2021-12-20

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d182 Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1 Medium parameters used: f = 1900 MHz;  $\sigma = 1.414 \text{ S/m}$ ;  $\epsilon_r = 39.36$ ;  $\rho = 1000 \text{ kg/m}^3$ Phantom section: Right Section

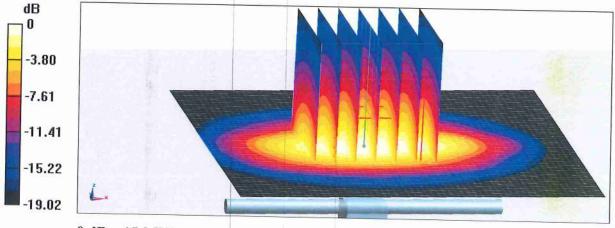
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 SN7307; ConvF(8.32, 8.32, 8.32) @ 1900 MHz; Calibrated: 2021-05-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection) 0
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15 .
- Phantom: MFP\_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062 0
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501) 0

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

dx=5mm, dy=5mm, dz=5mm Reference Value = 101.3 V/m; Power Drift = -0.01 dB Peak SAR (extrapolated) = 19.6 W/kg SAR(1 g) = 10 W/kg; SAR(10 g) = 5.07 W/kg Smallest distance from peaks to all points 3 dB below = 10 mm Ratio of SAR at M2 to SAR at M1 = 51%Maximum value of SAR (measured) = 15.9 W/kg

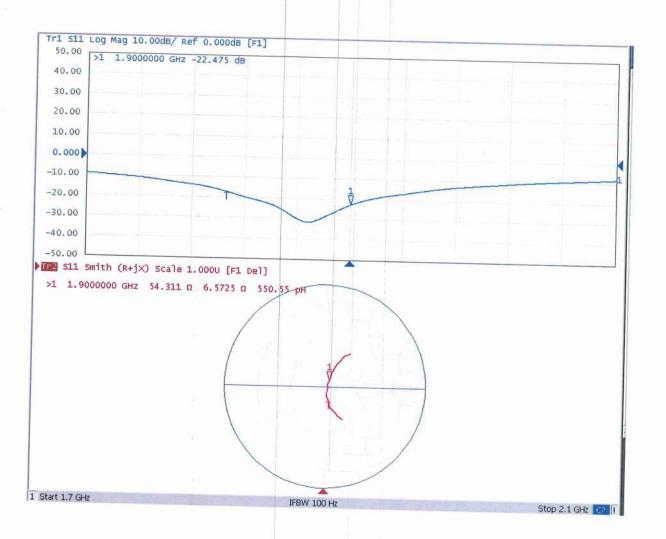


0 dB = 15.9 W/kg = 12.01 dBW/kg



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# Impedance Measurement Plot for Head TSL





# D1900V2, Serial No. 5d182 Extended Dipole Calibrations

If dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

D1900V2 – serial no. 5d182							
		1900 Head					
Date of	Return-Loss	Delta	Real Impedance	Delta	Imaginary Impedance	Delta	
Measurement	(dB)	(%)	(ohm)	(ohm)	(ohm)	(ohm)	
2021.12.20	-22.5		54.3		6.57		
2022.12.19	-22.5	0.0%	53.7	0.6	6.9	-0.33	
2023.12.19	-22.1	-1.8%	56.4	-2.1	4	2.57	

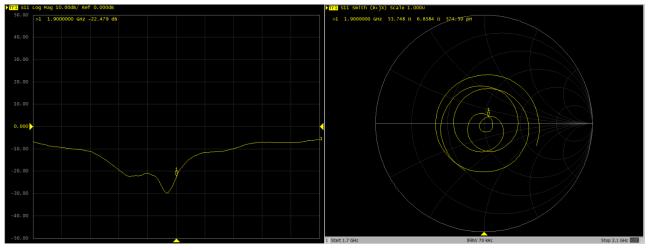
#### <Justification of the extended calibration>

The return loss is < -20dB, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

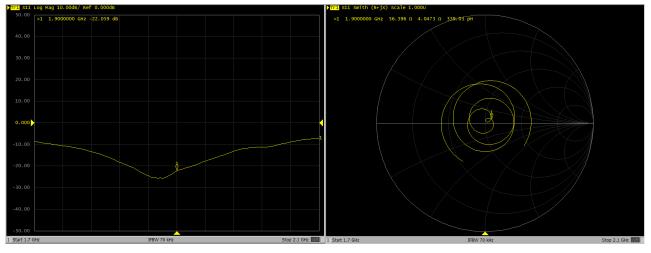


#### Dipole Verification Data> D1900V2, serial no. 5d182

#### 1900MHz - Head----2022.12.19



#### 1900MHz - Head----2023.12.19







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Client

Sporton

**Certificate No:** 

23J02Z80115

#### CALIBRATION CERTIFICATE Object D2450V2 - SN: 924 Calibration Procedure(s) FF-Z11-003-01 Calibration Procedures for dipole validation kits Calibration date: November 3, 2023 This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate. All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)°C and humidity<70%. Calibration Equipment used (M&TE critical for calibration) Scheduled Calibration ID# Primary Standards Cal Date (Calibrated by, Certificate No.) Power Meter NRP2 106276 15-May-23 (CTTL, No.J23X04183) May-24 Power sensor NRP6A 101369 15-May-23 (CTTL, No.J23X04183) May-24 Reference Probe EX3DV4 SN 7464 19-Jan-23(CTTL-SPEAG, No.Z22-60565) Jan-24 DAE4 SN 1556 11-Jan-23(CTTL-SPEAG, No.Z23-60034) Jan-24 Secondary Standards ID# Cal Date (Calibrated by, Certificate No.) Scheduled Calibration 05-Jan-23 (CTTL, No. J23X00107) Jan-24 Signal Generator E4438C MY49071430 NetworkAnalyzer E5071C MY46110673 10-Jan-23 (CTTL, No. J23X00104) Jan-24 Name Function Signature Calibrated by: Zhao Jing SAR Test Engineer Reviewed by: Lin Hao SAR Test Engineer Approved by: Qi Dianyuan SAR Project Leader Issued: November 7, 2023

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





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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.

DASY52	52.10.4
Advanced Extrapolation	
Triple Flat Phantom 5.1C	
10 mm	with Spacer
dx, dy, dz = 5 mm	
2450 MHz ± 1 MHz	
	Advanced Extrapolation Triple Flat Phantom 5.1C 10 mm 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	38.8 ± 6 %	1.83 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	250 mW input power	13.2 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	52.3 W/kg ± 18.8 % ( <i>k</i> =2)
SAR averaged over 10 <i>cm</i> <sup>3</sup> (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.17 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.5 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	50.2Ω+ 7.23jΩ	
Return Loss	- 22.9dB	

#### General Antenna Parameters and Design

Electrical Delay (one direction)	1.061 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

Manufactured by	SPEAG
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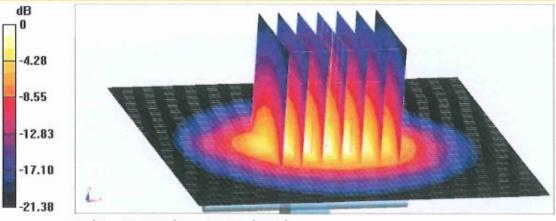


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DASY5 Validation Report for Head TSLDate: 2023-11-03Test Laboratory: CTTL, Beijing, ChinaDUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 924Communication System: UID 0, CW; Frequency: 2450 MHzMedium parameters used: f = 2450 MHz;  $\sigma = 1.827$  S/m;  $\varepsilon_r = 38.76$ ;  $\rho = 1000$  kg/m<sup>3</sup>Phantom section: Right SectionMeasurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)DASY5 Configuration:

- Probe: EX3DV4 SN7464; ConvF(7.67, 7.67, 7.67) @ 2450 MHz; Calibrated: 2023-01-19
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2023-01-11
- 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**/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 101.5 V/m; Power Drift = -0.05 dB Peak SAR (extrapolated) = 27.3 W/kg **SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.17 W/kg** Smallest distance from peaks to all points 3 dB below = 8.9 mm Ratio of SAR at M2 to SAR at M1 = 49.1% Maximum value of SAR (measured) = 22.2 W/kg



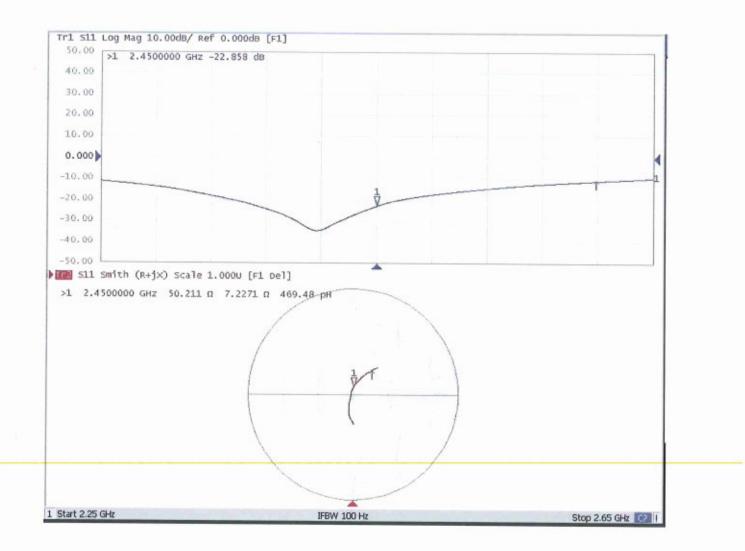
0 dB = 22.2 W/kg = 13.46 dBW/kg





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#### Impedance Measurement Plot for Head TSL



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Tel: +86-10-62304	'uanBei Road, Haidia 4633-2079 Fax:	n District, Beijing, 100191 +86-10-62304633-2504		CNAS	校准 CALIBRATION CNAS L0570
E-mail: cttl@chin		//www.chinattl.cn	0.00		CITIC LOUTE
	orton		Certificate No:	Z21-60554	
CALIBRATION C	ERTIFICA	TE			
Object	D2600	V2 - SN: 1070			
Calibration Procedure(s)	FE 74				
		1-003-01	dim alla societta en en en en		
0-111-11-1-1	Calibra	ation Procedures for	alpole validation kits		
Calibration date:	Decen	ber 20, 2021			
This calibration Certificate measurements (SI). The me pages and are part of the ce	easurements and	traceability to natior the uncertainties wi	al standards, whicl h confidence proba	h realize the phys bility are given on	sical units of the following
All calibrations have been humidity<70%.	conducted in	he closed laborator	y facility: environm	ent temperature	(22±3)℃ and
Calibration Equipment used	I (M&TE critical f	or calibration)			=
Primary Standards Power Meter NRP2	ID #		ed by, Certificate No	.) Scheduled	Calibration
Power sensor NRP8S	106277 104291	24-Sep-21 (CTTL,		Se	p-22
Reference Probe EX3DV4		24-Sep-21 (CTTL,	and the second		p-22
DAE4	SN 1556		No.EX3-7307_May No.DAE4-1556_Jan		ay-22
			10.DAE4-1556_Jan	Jai	n-22
Secondary Standards	ID #	Cal Date (Calibrate	d by, Certificate No.	) Scheduled	Calibration
Signal Generator E4438C	MY49071430	01-Feb-21 (CTTL, I			n-22
Network Analyzer E5071C	MY46110673	14-Jan-21 (CTTL, N	lo.J21X00232)		n-22
	Name	Function		Signati	100
Calibrated by:	Zhao Jing	SAR Test Eng	ineer	AL AL	
Reviewed by:	Lin Hao	SAR Test Eng	ineer	the	>
pproved by:	Qi Dianyuan	SAR Project L	eader	dua	
his calibration certificate sh	all not be reprod	uced except in full wi	Issued: D thout written approv	ecember 27, 2021 al of the laborator	у.
Certificate No: Z21-60554		Page 1 of 6			



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Appendix C

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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. 0 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	V52.10.4
Extrapolation	Advanced Extrapolation	V02.10.4
Phantom	Triple Flat Phantom 5.1C	
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	40.1 ± 6 %	1.97 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C		

# SAR result with Head TSL

Condition	
250 mW input power	14.0 W/kg
normalized to 1W	56.2 W/kg ± 18.8 % (k=2)
Condition	
250 mW input power	6.14 W/kg
normalized to 1W	24.6 W/kg ± 18.7 % (k=2)
	250 mW input power normalized to 1W Condition 250 mW input power



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

# Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.5Ω- 6.60jΩ	
Return Loss	- 23.6dB	

# General Antenna Parameters and Design

Electrical Delay (one direction)	1.058 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

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DASY5 Validation Report for Head TSL Test Laboratory: CTTL, Beijing, China DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1070

Date: 2021-12-20

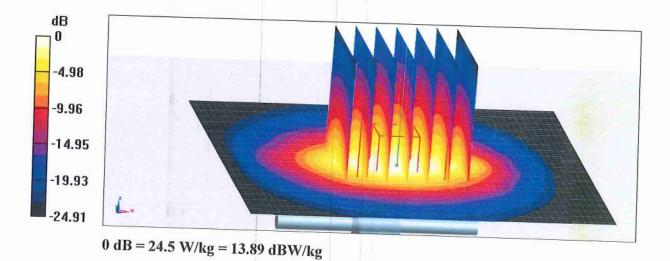
Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1 Medium parameters used: f = 2600 MHz;  $\sigma$  = 1.97 S/m;  $\epsilon_r$  = 40.05;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Right Section

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

- Probe: EX3DV4 SN7307; ConvF(7.5, 7.5, 7.5) @ 2600 MHz; Calibrated: . 2021-05-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15
- 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/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 106.3 V/m; Power Drift = -0.02 dB Peak SAR (extrapolated) = 30.8 W/kg SAR(1 g) = 14 W/kg; SAR(10 g) = 6.14 W/kg Smallest distance from peaks to all points 3 dB below = 9 mmRatio of SAR at M2 to SAR at M1 = 44.7%Maximum value of SAR (measured) = 24.5 W/kg



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