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	CALIB	RATION LABORATORY	-	国际互认
Add: No.52 Hua Tel: +86-10-6230 E-mail: cttl@chi	nYuanBei Road, Hai 04633-2079 Fa	dian District, Beijing, 100191, x: +86-10-62304633-2504 p://www.chinattl.cn	a AC-MRA	校准 CALIBRATION CNAS L0570
Client Sp	orton		Certificate No:	Z21-60550
CALIBRATION	CERTIFICA			
Object	D750	)V3 - SN: 1099		
	0150	103-311. 1099		
Calibration Procedure(s)	FF-7	11-003-01		
		ration Procedures for di	nole validation kite	a gran fact
Calibration date:			pole validation kits	
calibration date.	Dece	mber 15, 2021		
annocontra Alexandra Alexandra			facility: environment	temperature (22±3)℃ and
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Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards	ID # 106277 104291 SN 7307 SN 1556 ID # MY49071430	for calibration) Cal Date (Calibrated 24-Sep-21 (CTTL, No 24-Sep-21 (CTTL, No 26-May-21(SPEAG, No 15-Jan-21(SPEAG, No Cal Date (Calibrated 01-Feb-21 (CTTL, No 14-Jan-21 (CTTL, No	d by, Certificate No.) 5.J21X08326) 5.J21X08326) lo.EX3-7307_May21) 5.DAE4-1556_Jan21) by, Certificate No.) 5.J21X00593)	Scheduled Calibration Sep-22 Sep-22 May-22 Jan-22 Scheduled Calibration Jan-22 Jan-22
Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C	ID # 106277 104291 SN 7307 SN 1556 ID # MY49071430 MY46110673 Name	for calibration) Cal Date (Calibrated 24-Sep-21 (CTTL, No 24-Sep-21 (CTTL, No 26-May-21(SPEAG, No 15-Jan-21(SPEAG, No Cal Date (Calibrated 01-Feb-21 (CTTL, No 14-Jan-21 (CTTL, No	d by, Certificate No.) 5.J21X08326) 5.J21X08326) 10.EX3-7307_May21) 5.DAE4-1556_Jan21) by, Certificate No.) 5.J21X00593) .J21X00232)	Scheduled Calibration Sep-22 Sep-22 May-22 Jan-22 Scheduled Calibration Jan-22
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Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C	ID # 106277 104291 SN 7307 SN 1556 ID # MY49071430 MY46110673 Name Zhao Jing	for calibration) Cal Date (Calibrated 24-Sep-21 (CTTL, No 24-Sep-21 (CTTL, No 26-May-21(SPEAG, No 15-Jan-21(SPEAG, No Cal Date (Calibrated 01-Feb-21 (CTTL, No 14-Jan-21 (CTTL, No Function SAR Test Engin	d by, Certificate No.) 5.J21X08326) 5.J21X08326) 10.EX3-7307_May21) 5.DAE4-1556_Jan21) by, Certificate No.) 5.J21X00593) .J21X00232) eer eer	Scheduled Calibration Sep-22 Sep-22 May-22 Jan-22 Scheduled Calibration Jan-22 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

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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%.

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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	I
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	

## **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 for nominal Head TSL parameters	normalized to 1W	5.65 W/kg ± 18.7 % (k=2)
SAR measured	250 mW input power	1.43 W/kg
SAR averaged over 10 $cm^3$ (10 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	normalized to 1W	8.54 W/kg ± 18.8 % (k=2)
SAR measured	250 mW input power	2.17 W/kg
SAR averaged over 1 $cm^3$ (1 g) of Head TSL	Condition	



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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 Delaw (and discussion)	
Electrical Delay (one direction)	0.942 ns
	0.342 115

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	
		b Ti	
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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

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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

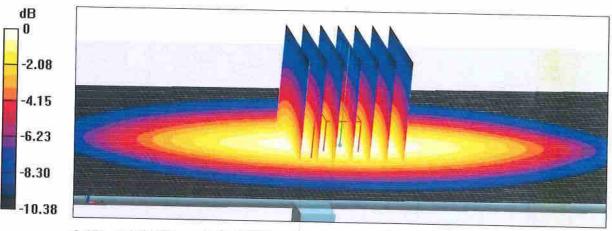
Reference Value = 56.18 V/m; Power Drift = -0.01 dB

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

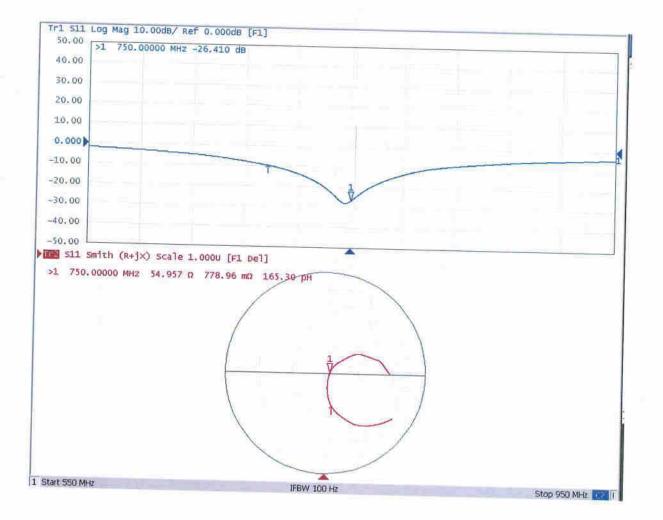


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# Impedance Measurement Plot for Head TSL





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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. 1099						
	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

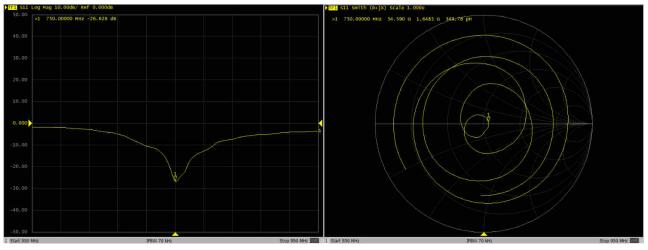
#### <Justification of the extended calibration>

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.



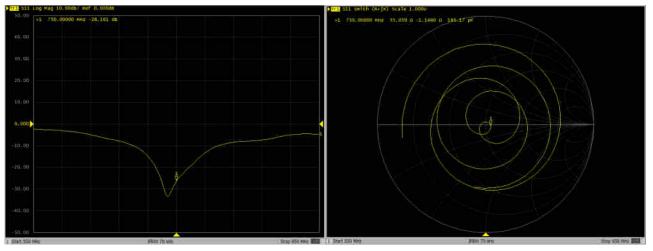
## Dipole Verification Data> D750V3, serial no. 1099

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



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

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CALIBRATION C	ERTIFI	CATE	J. Sugar	1.		
Object						
	D	)835V2 - S	SN: 4d162			
Calibration Procedure(s)	F	F-Z11-003	3-01			
			Procedures for dipo	ole validation kits		
Calibration date:		ecember				
A 40 00 00 10						
This calibration Certificate	documents	the trace	eability to national	standards, which	realize the	physical units of
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All calibrations have been	conducted	in the c	losed laboratory f	-		
umidity<70%.			aboratory is	acinty, environme	nt temperat	ure (22±3)°C and
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rimary Standards	ID#	C	844			
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Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4	104291 SN 7307	24- 24- 26- 15-	Sep-21 (CTTL, No Sep-21 (CTTL, No May-21(SPEAG,No Jan-21(SPEAG,No.	J21X08326) J21X08326) .EX3-7307_May2 DAE4-1556_Jan2	1) 1)	Sep-22 Sep-22 May-22 Jan-22
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Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C	104291 SN 7307 SN 1556 ID # MY49071 MY461108	24- 24- 26- 15- Cal 430 01-1	Sep-21 (CTTL, No., Sep-21 (CTTL, No., May-21(SPEAG,No Jan-21(SPEAG,No. Date (Calibrated by Feb-21 (CTTL, No., Jan-21 (CTTL, No.,J	J21X08326) J21X08326) .EX3-7307_May2 DAE4-1556_Jan2 /, Certificate No.) I21X00593) 21X00232)	1) 1) Schedu	Sep-22 Sep-22 May-22 Jan-22 Iled Calibration Jan-22
Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C	104291 SN 7307 SN 1556 ID # MY49071 MY461100 Name Zhao Jing	24- 24- 26- 15- Cal 430 01-1	Sep-21 (CTTL, No., Sep-21 (CTTL, No., May-21(SPEAG,No. Jan-21(SPEAG,No.) Date (Calibrated by Feb-21 (CTTL, No., Jan-21 (CTTL, No., Function SAR Test Enginee	J21X08326) J21X08326) EX3-7307_May2 DAE4-1556_Jan2 /, Certificate No.) I21X00593) 21X00232)	1) 1) Schedu	Sep-22 Sep-22 May-22 Jan-22 Jan-22 Jan-22 Jan-22
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Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C	104291 SN 7307 SN 1556 ID # MY49071 MY461100 Name Zhao Jing	24- 26- 15- Cal 430 01-1 673 14-,	Sep-21 (CTTL, No., Sep-21 (CTTL, No., May-21(SPEAG,No. Jan-21(SPEAG,No.) Date (Calibrated by Feb-21 (CTTL, No., Jan-21 (CTTL, No., Function SAR Test Enginee	J21X08326) J21X08326) EX3-7307_May2 DAE4-1556_Jan2 /, Certificate No.) I21X00593) 21X00232)	1) 1) Schedu	Sep-22 Sep-22 May-22 Jan-22 Jan-22 Jan-22 Jan-22
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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) 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 0 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
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.8 ± 6 %	0.91 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	2.44 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	
Return Loss	- 27.7dB	-

## General Antenna Parameters and Design

Electrical Delay (one direction)	AL (22/2022)
Listenida Boldy (one direction)	1.346 ns
	Asima yan Me

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** 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) 0
- Electronics: DAE4 Sn1556; Calibrated: 2021-01-15 •
- Phantom: MFP\_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062 θ
- 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

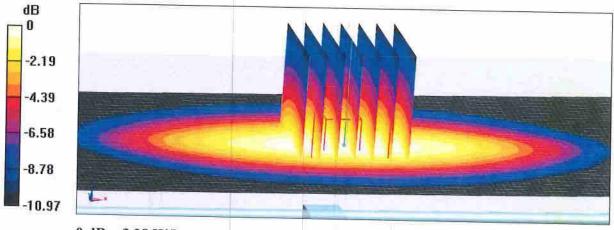
Peak SAR (extrapolated) = 3.70 W/kg

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

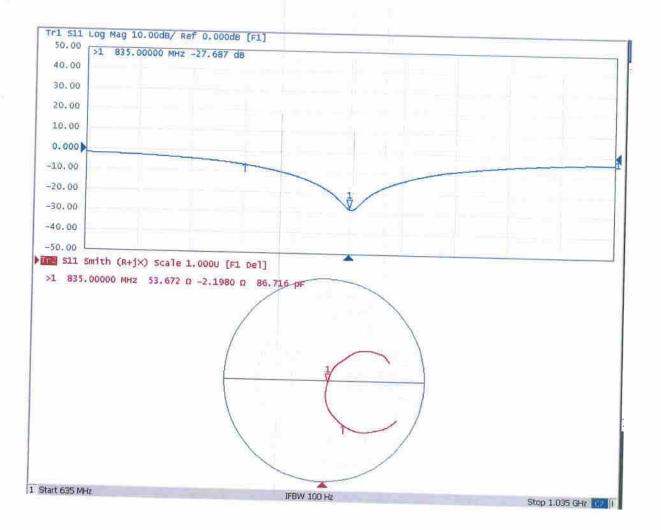
Certificate No: Z21-60551

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# Impedance Measurement Plot for Head TSL



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# 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	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

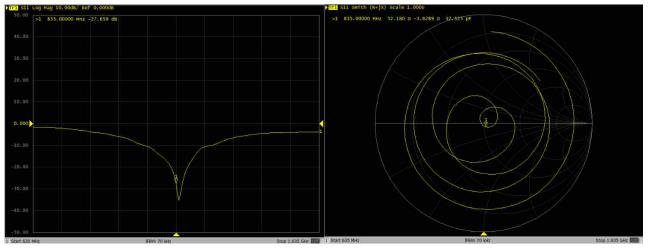
#### <Justification of the extended calibration>

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.

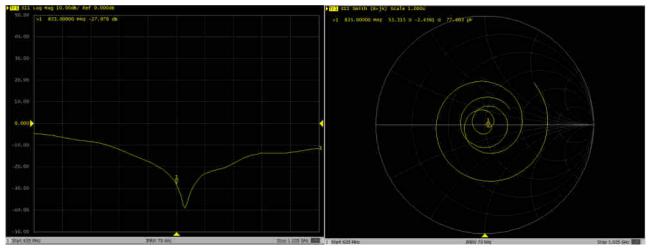


## Dipole Verification Data> 835V2, serial no. 4d162

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



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



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		ION LABORATORY	HACE MEA C	<b>NAS</b> 校准 CALIBRATION
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Client sporto	1	Cer	tificate No: Z21-	60374
CALIBRATION CE	RTIFICAT	E		
Object	D1750V	/2 - SN: 1137		
Calibration Procedure(s)	FF-Z11- Calibrat	003-01 ion Procedures for dipe	ble validation kits	
Calibration date:	October	19, 2021		
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All calibrations have been humidity<70%.	conducted in th	ne closed laboratory	acility: environment to	emperature (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-SPE	AG,No.Z21-60001)	Feb-22
DAE4	SN 1556	15-Jan-21(SPEAG,No	DAE4-1556_Jan21)	Jan-22
Secondary Standards	ID#	Cal Date (Calibrated	oy, Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	01-Feb-21 (CTTL, No		Jan-22
NetworkAnalyzer E5071C	MY46110673	14-Jan-21 (CTTL, No	J21X00232)	Jan-22
	Name	Function		Signature
Calibrated by:	Zhao Jing	SAR Test Engin	eer	EU.
Reviewed by:	Lin Hao	SAR Test Engir	eer	Mr. H
Approved by:	Qi Dianyuan	SAR Project Le	ader <	zia
			Issued: Octob	388773614 W232588522571
This calibration certificate sh	all not be reproc	duced except in full with	nout written approval o	f the laboratory.
Certificate No: Z21-60374	4	Page 1 of 6		



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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
	119 (4119) (419) (419)

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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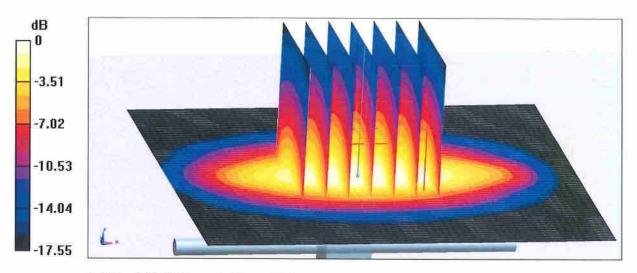
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DASY5 Validation Report for Head TSLDate: 10.19.2021Test Laboratory: CTTL, Beijing, ChinaDUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1137Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1Medium parameters used: f = 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

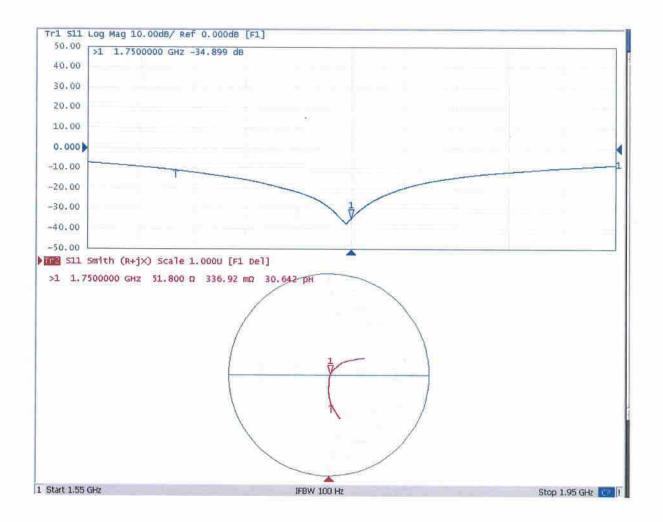




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## Impedance Measurement Plot for Head TSL





# 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

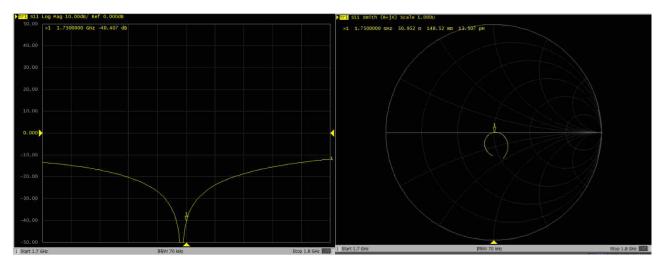
#### <Justification of the extended calibration>

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. Appendix C

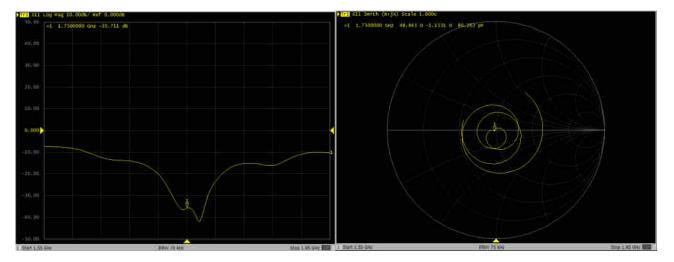


## Dipole Verification Data> D1750V2, serial no. 1137

## 1750MHz - Head----2022.10.18



## 1750MHz - Head----2023.10.18



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Calibration Procedure(s)					
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	Calibration	Procedures for dipo	ble validation kits		
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DAE4			EX3-7307_May21)		y-22
DAL4	SN 1556 15	-Jan-21(SPEAG,No.	DAE4-1556_Jan21)	Jan	1-22
Secondary Standards	ID# Ca	l Date (Calibrated b	v. Certificate No.)	Scheduled (	alibration
Signal Generator E4438C		-Feb-21 (CTTL, No.			1-22
NetworkAnalyzer E5071C		Jan-21 (CTTL, No.J			1-22
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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

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: Z21-60553

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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	39.4 ± 6 %	1.41 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	12522	

## 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+ 6.57jΩ	
Return Loss	- 22.5dB	

## General Antenna Parameters and Design

Electrical Delay (one direction)	2 18/4/S:
	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

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Appendix C



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

Date: 2021-12-20

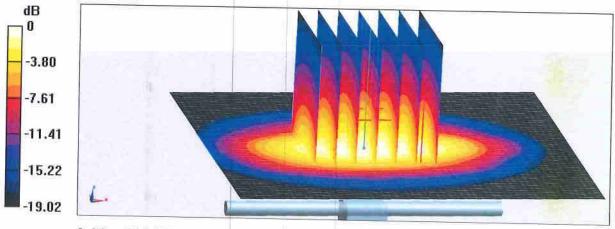
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d182 Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1 Medium parameters used: f = 1900 MHz;  $\sigma = 1.414$  S/m;  $\varepsilon_r = 39.36$ ;  $\rho = 1000$  kg/m<sup>3</sup> Phantom section: Right Section

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

- Probe: EX3DV4 SN7307; ConvF(8.32, 8.32, 8.32) @ 1900 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)

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



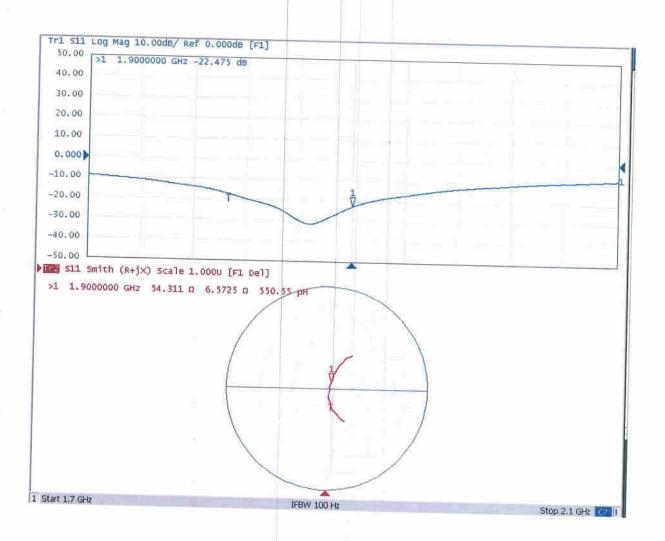
0 dB = 15.9 W/kg = 12.01 dBW/kg

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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

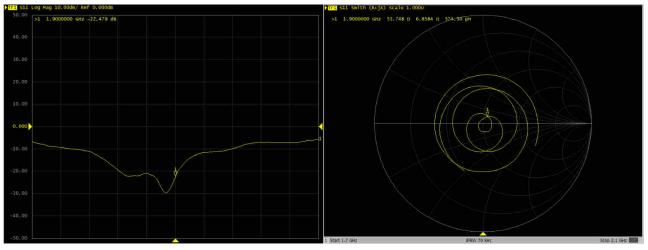
#### <Justification of the extended calibration>

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.

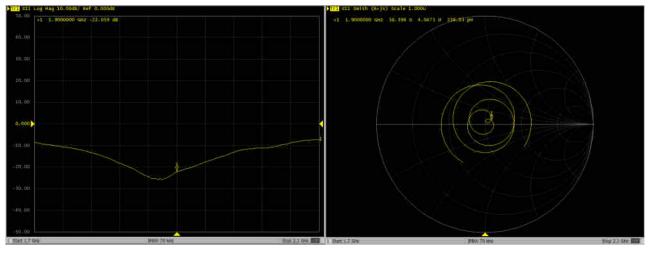


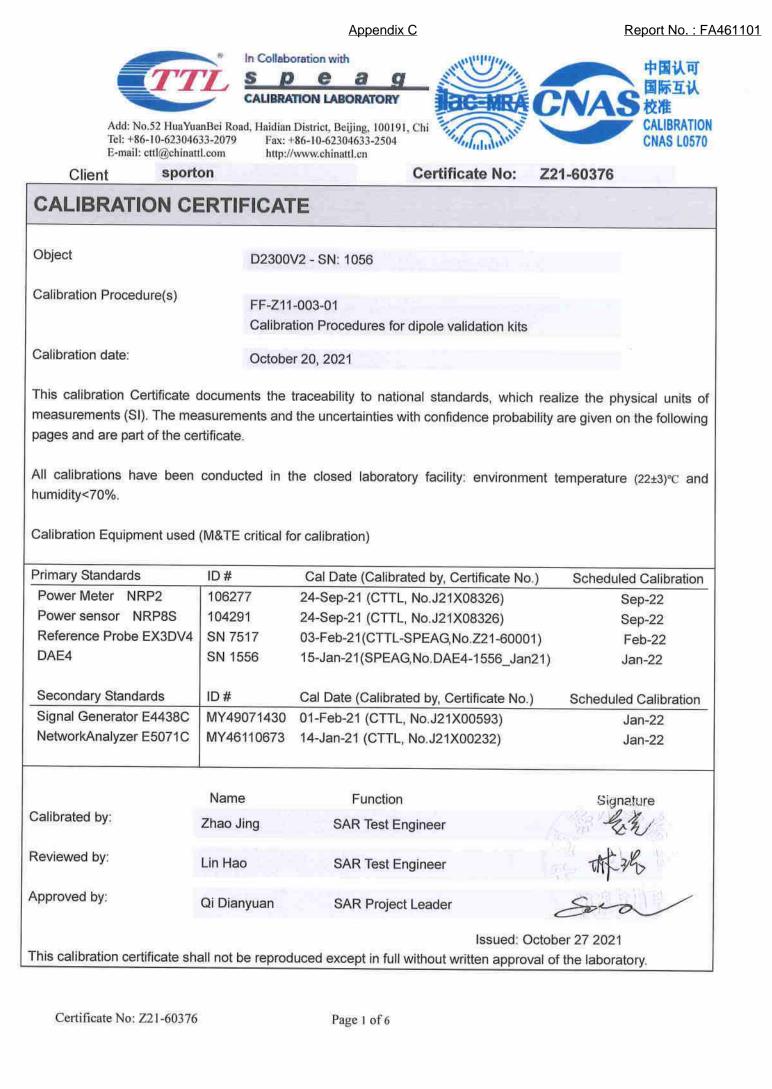
## Dipole Verification Data> D1900V2, serial no. 5d182

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



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





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## **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. 0
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna 0 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.

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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	2300 MHz ± 1 MHz	

#### **Head TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.5	1.67 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.2 ± 6 %	1.66 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C		3 <del></del>

## SAR result with Head TSL

SAR averaged over 1 $cm^3$ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	12.2 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	48.8 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	5.71 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.8 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	48.3Ω- 4.07jΩ
Return Loss	- 27.0dB

#### General Antenna Parameters and Design

Electrical Delay (one direction)	1.076 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

Date: 10.20.2021

DUT: Dipole 2300 MHz; Type: D2300V2; Serial: D2300V2 - SN: 1056 Communication System: UID 0, CW; Frequency: 2300 MHz; Duty Cycle: 1:1 Medium parameters used: f = 2300 MHz;  $\sigma = 1.662 \text{ S/m}$ ;  $\varepsilon_r = 39.17$ ;  $\rho = 1000 \text{ kg/m}^3$ Phantom section: Right Section

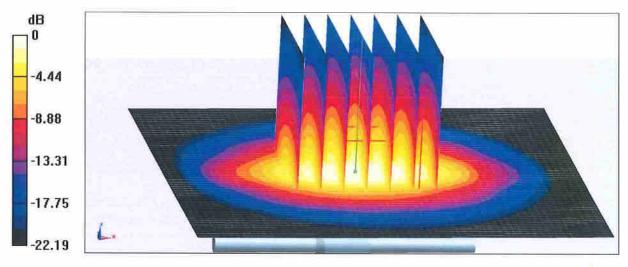
**DASY5** Configuration:

- Probe: EX3DV4 SN7517; ConvF(7.58, 7.58, 7.58) @ 2300 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 ø (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 = -0.01 dB Peak SAR (extrapolated) = 25.2 W/kg SAR(1 g) = 12.2 W/kg; SAR(10 g) = 5.71 W/kgSmallest distance from peaks to all points 3 dB below = 9 mm

Ratio of SAR at M2 to SAR at M1 = 48.3%

Maximum value of SAR (measured) = 20.4 W/kg



0 dB = 20.4 W/kg = 13.10 dBW/kg

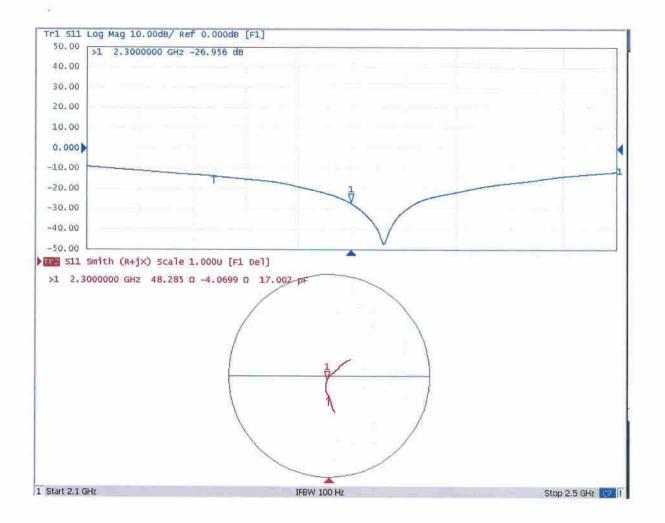


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## Impedance Measurement Plot for Head TSL



Certificate No: Z21-60376



# D2300V2, Serial No. 1056 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.

D2300V2 – serial no. 1056						
		2300 Head				
Date of Measurement	Return-Loss (dB)	turn-Loss (dB) Delta (%) Real Impedance (ohm) Delta (ohm) Imaginary Impedance (ohm) Delta				Delta (ohm)
2021.10.20	-27		48.3		-4.1	
2022.10.19	-24.4	-9.6%	45.9	2.4	-4.1	0
2023.10.19	-27.9	3.3%	48.7	-0.4	-3.7	-0.4

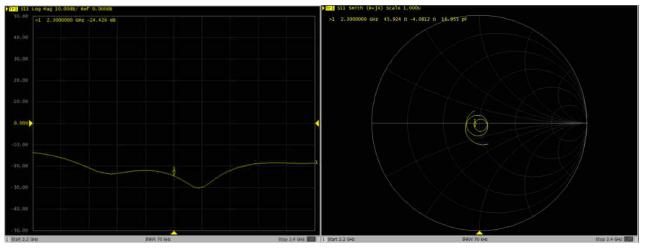
#### <Justification of the extended calibration>

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.

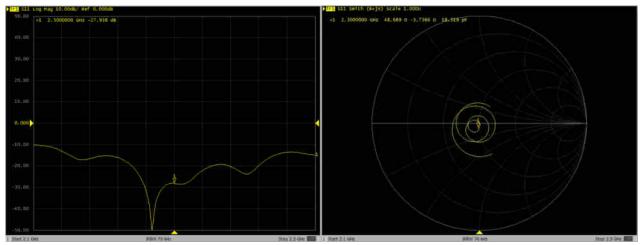


## Dipole Verification Data> D2300V2, serial no. 1056

#### 2300MHz - Head--2022.10.19



## 2300MHz - Head--2023.10.19







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Certificate No:

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CALIBRATION CE	ERTIFICAT	E	
Object	D2450\	/2 - SN: 924	
Calibration Procedure(s)	FF-Z11	-003-01	
		tion Procedures for dipole validation kits	
Calibration date:	Novem	ber 3, 2023	
measurements (SI). The me pages and are part of the ce	asurements and ertificate.	traceability to national standards, which rea the uncertainties with confidence probability he closed laboratory facility: environment	are given on the following
Calibration Equipment used	(M&TE critical fo	or calibration)	
Primary Standards	ID#	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
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
Signal Generator E4438C	MY49071430	05-Jan-23 (CTTL, No. J23X00107)	Jan-24
NetworkAnalyzer E5071C	MY46110673	10-Jan-23 (CTTL, No. J23X00104)	Jan-24
	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	表意
Reviewed by:	Lin Hao	SAR Test Engineer	11-79
Approved by:	Qi Dianyuan	SAR Project Leader	Adr
This calibration coutificate at		Issued: Nove	ember 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%.

Appendix C





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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, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

## **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 % (k=2)
SAR averaged over 10 cm <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 % ( <i>k</i> =2)

Appendix C





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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
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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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<u>Appendix C</u>



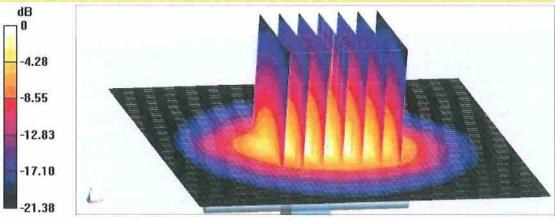


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DASY5 Validation Report for Head TSLDate: 2023-11-03Test Laboratory: CTTL, Beijing, ChinaDUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 924Communication System: UID 0, CW; Frequency: 2450 MHzMedium parameters used: f = 2450 MHz;  $\sigma = 1.827$  S/m;  $\varepsilon_r = 38.76$ ;  $\rho = 1000$  kg/m<sup>3</sup>Phantom section: Right Section<br/>Measurement 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

