1.1. D750V3 Dipole Calibration Certificate

Add: No.51 Xueyuan Ro	070 Eav: +86-1	10-62304633-2504	CNAS L0570
Tel: +86-10-62304633-2 E-mail: cttl@chinattl.com		Certificate No: Z21-6	0016
Client	TIEICATE		
ALIBRATION CER	TIFICATE		
	D750V3 -	CN: 1180	1111
bject	D120A2 -	SN. 1100	
alibration Procedure(s)	FF-Z11-0	03-01	
andradon i roosasta (1)	Calibratio	on Procedures for dipole validation kits	
			10000
alibration date:	January 2	22, 2021 aceability to national standards, which realiz	
		a closed laboratory lacing. crivitorities	weedly as a second s
numidity<70%.		he closed laboratory facility: environment to or calibration)	
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humidity<70%. Calibration Equipment used (Primary Standards	M&TE critical fo	or calibration) Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration May-21
numidity<70%. Calibration Equipment used (Primary Standards Power Meter NRP2	M&TE critical fo ID # 106276	Cal Date(Calibrated by, Certificate No.) 12-May-20 (CTTL, No.J20X02965) 12-May-20 (CTTL, No.J20X02965)	Scheduled Calibration May-21 May-21
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numidity<70%. Calibration Equipment used (Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4	M&TE critical fo ID # 106276 101369 SN 7600 SN 771	Cal Date(Calibrated by, Certificate No.) 12-May-20 (CTTL, No.J20X02965) 12-May-20 (CTTL, No.J20X02965) 30-Nov-20(CTTL-SPEAG,No.Z20-60421) 10-Feb-20(CTTL-SPEAG,No.Z20-60017)	Scheduled Calibration May-21 May-21 Nov-21 Feb-21
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Calibration Equipment used (Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C	M&TE critical fo ID # 106276 101369 SN 7600 SN 771 ID # MY49071430 MY46110673 Name Zhao Jing	Cal Date(Calibrated by, Certificate No.) 12-May-20 (CTTL, No.J20X02965) 12-May-20 (CTTL, No.J20X02965) 30-Nov-20(CTTL-SPEAG,No.Z20-60421) 10-Feb-20(CTTL-SPEAG,No.Z20-60017) Cal Date(Calibrated by, Certificate No.) 25-Feb-20 (CTTL, No.J20X00516) 10-Feb-20 (CTTL, No.J20X00515) Function SAR Test Engineer SAR Test Engineer SAR Project Leader	Scheduled Calibration May-21 May-21 Nov-21 Feb-21 Scheduled Calibratio Feb-21 Feb-21 Signature
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Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504 E-mail: cttl@chinattl.com http://www.chinattl.cn

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%.

Certificate No: Z21-60016

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S e p g а CALIBRATION LABORATORY

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Measurement Conditions

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	

Head TSL parameters The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.3 ± 6 %	0.91 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	2)	

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.13 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.43 W/kg ± 18.8 % (k=2)
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.59 W/kg ± 18.7 % (k=2)

Certificate No	: Z21-60016
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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.6Ω- 1.34jΩ		
Return Loss	- 28.6dB		

General Antenna Parameters and Design

Electrical Delay (one direction)	0.944 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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DASY5 Validation Report for Head TSL

Date: 01.22.2021

Test Laboratory: CTTL, Beijing, China DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1180

Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1 Medium parameters used: f = 750 MHz; σ = 0.905 S/m; ε_r = 42.25; ρ = 1000 kg/m3

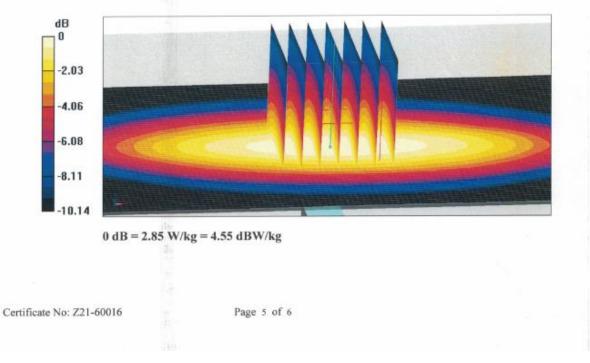
Phantom section: Right Section

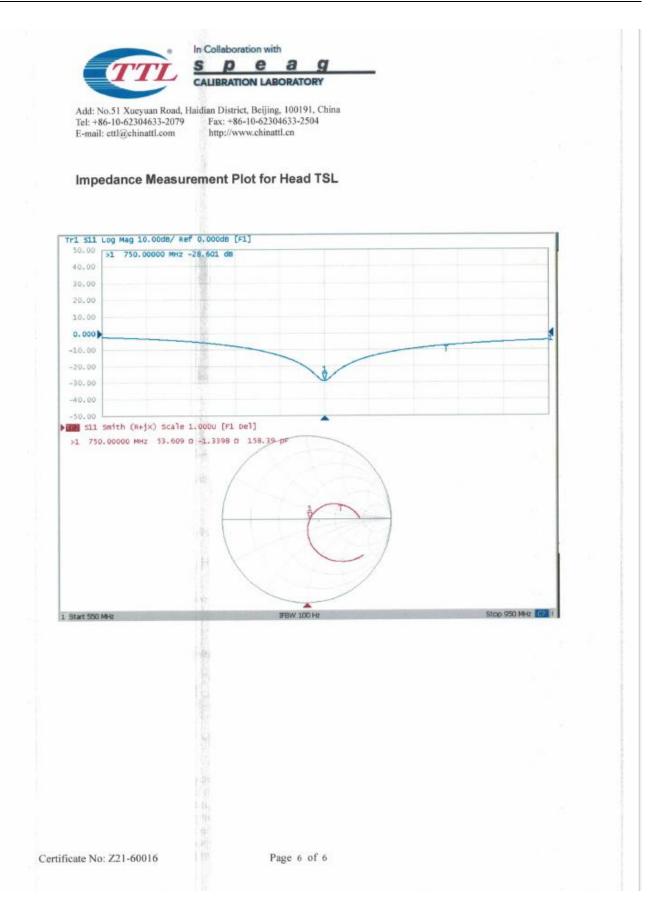
DASY5 Configuration:

- Probe: EX3DV4 SN7600; ConvF(10.88, 10.88, 10.88) @ 750 MHz; Calibrated: 2020-11-30
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn771; Calibrated: 2020-02-10
- 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 (7483)

Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.99 V/m; Power Drift = 0.00 dB Peak SAR (extrapolated) = 3.25 W/kg SAR(1 g) = 2.13 W/kg; SAR(10 g) = 1.41 W/kg Smallest distance from peaks to all points 3 dB below = 22.7 mm Ratio of SAR at M2 to SAR at M1 = 65.6% Maximum value of SAR (measured) = 2.85 W/kg



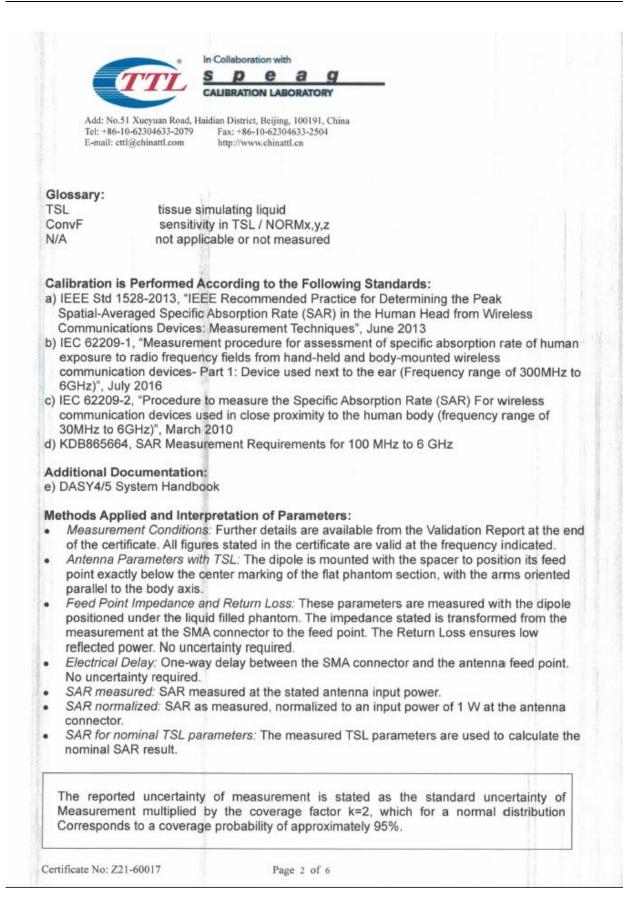


Referring to KDB865664 D01, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

Head-750						
Date of	Return-loss (dB)	Delta (%)	Real Impedance	Delta	Imaginary	Delta
measurement	Return-1055 (ub)		(ohm)	(ohm)	impedance (ohm)	(ohm)
2021-01-22	-28.6		53.6		-1.34	
2022-01-17	-28.1	1.75	53.5	0.1	-1.11	0.23

1.2. D835V2 Dipole Calibration Certificate

Add: No.51 Xuevu		strict, Beijing, 100191, China	ACN	AS 校准 CALI	BRATION
Tel: +86-10-62304 E-mail: cttl@china	633-2079 Fax: -	+86-10-62304633-2504		CNAS	S L0570
Client HTW		Certificate No	: Z21-6	0017	
the second se	EDTIFICAT	re l	1000	The second second	
CALIBRATION C	ERTIFICAT	IE	and the second second		
Object	D835V	/2 - SN: 4d238			
Calibration Procedure(s)		222.24			
	and the second se	I-003-01 ation Procedures for dipole validation k	rite		
	Galibra	ation Procedures for cipole validation k	urs.		
Calibration date:	Januar	y 22, 2021			
All calibrations have been	n conducted in	the closed laboratory facility: enviro	onment tem	perature(22±3)	c and
humidity<70%. Calibration Equipment used			No.) So 0421)	cheduled Calib May-21 May-21 Nov-21 Feb-21	
humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4	d (M&TE critical f ID # 106276 101369 SN 7600 SN 771	or calibration) Cal Date(Calibrated by, Certificate 12-May-20 (CTTL, No.J20X02965) 12-May-20 (CTTL, No.J20X02965) 30-Nov-20(CTTL-SPEAG,No.Z20-60 10-Feb-20(CTTL-SPEAG,No.Z20-60	No.) So 0421) 0017)	cheduled Calib May-21 May-21 Nov-21 Feb-21	ration
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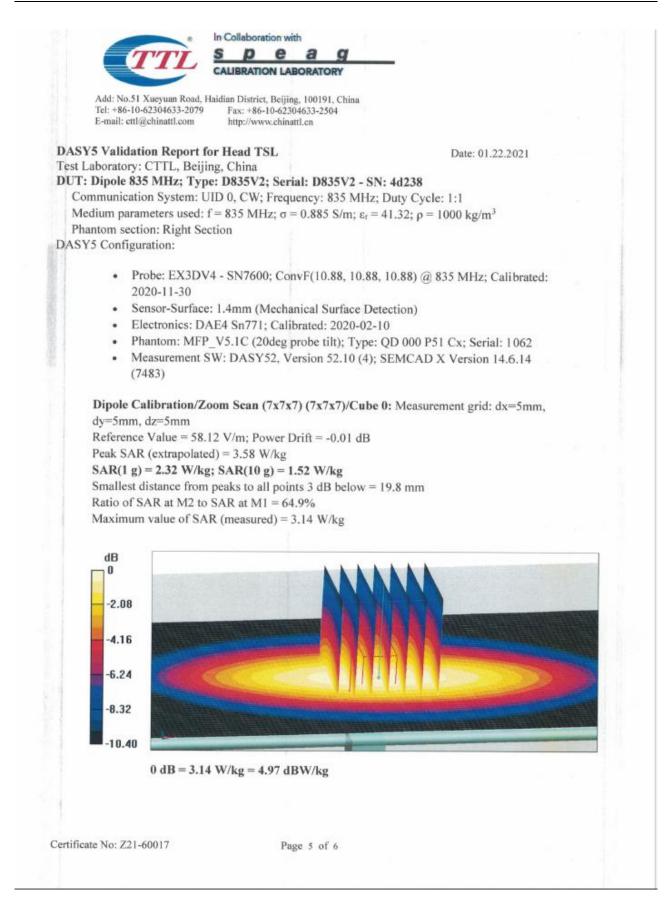


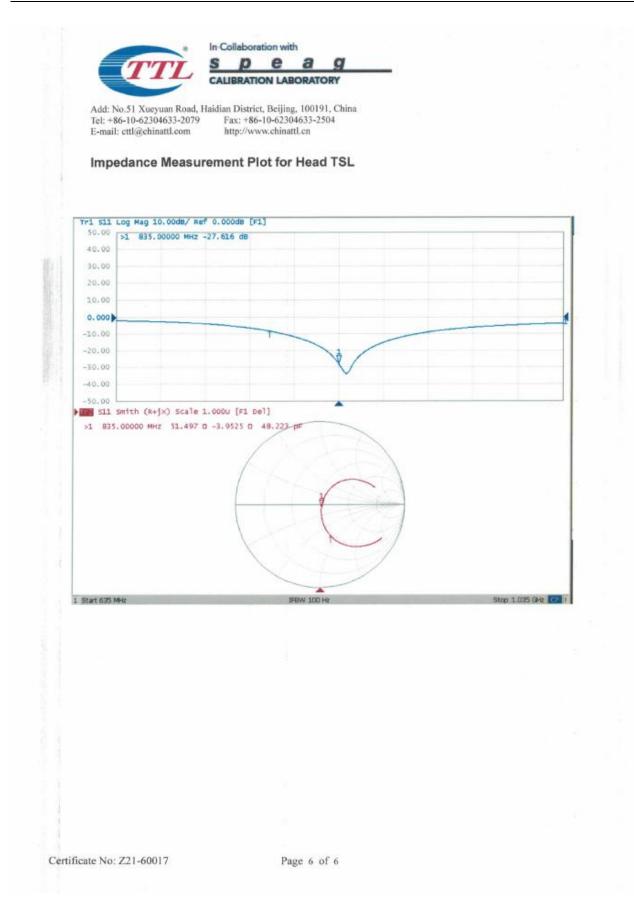
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DASY Version		DASY52			V52.10.4
Extrapolation	Advan	ced Extrapolation			
Phantom	Triple	Flat Phantom 5.1C			
Distance Dipole Center - TSL		15 mm		V	with Spacer
Zoom Scan Resolution	dx,	dy, dz = 5 mm			
Frequency	835	MHz ± 1 MHz			
Head TSL parameters The following parameters and calco	ulations were a	pplied. Temperature	Permitti	vity	Conductivity
Nominal Head TSL parameters		22.0 °C	41.5		0.90 mho/m
Measured Head TSL parameter	s	(22.0 ± 0.2) °C	41.3 ± 0	3 %	0.89 mho/m ± 6 %
Head TSL temperature change	during test	<1.0 °C			
AR result with Head TSL					
SAR averaged over 1 cm ³ (1 g) of Head TSL	Condit	ion		
SAR measured		250 mW in	put power	2.32 W/kg	
SAR measured	SAR for nominal Head TSL parameters		d to 1W	9.39	W/kg ± 18.8 % (<i>k</i> =2)
			inn		
	g) of Head TS	L Condit	250 mW input power		
SAR for nominal Head TSL para	g) of Head TS				1.52 W/kg

Certificate No: Z21-60017

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Appendix (Additional ass	essments outside the scor	pe of CNAS L0570)	
Antenna Parameters with	Head TSL		
Impedance, transformed to fee	ed point	51.5Ω- 3.95jΩ	
Return Loss		- 27.6dB	
Seneral Antenna Paramet	ters and Design		
Electrical Delay (one direction))	1.298 ns	
e measured. The dipole is made of standard onnected to the second arm of f the dipoles, small end caps a ccording to the position as exp ffected by this change. The over	radiated power, only a slight warn semirigid coaxial cable. The cen if the dipole. The antenna is there are added to the dipole arms in or plained in the "Measurement Con erall dipole length is still accordir plied to the dipole arms, because may be damaged.	ter conductor of the feeding li fore short-circuited for DC-sig der to improve matching whe ditions" paragraph. The SAR ing to the Standard.	ne is directly mals. On sor n loaded data are not
e measured. The dipole is made of standard onnected to the second arm of f the dipoles, small end caps a ccording to the position as exp ffected by this change. The ovi lo excessive force must be app	semirigid coaxial cable. The cen I the dipole. The antenna is there are added to the dipole arms in or plained in the "Measurement Con erall dipole length is still accordir plied to the dipole arms, because	ter conductor of the feeding li fore short-circuited for DC-sig der to improve matching whe ditions" paragraph. The SAR ing to the Standard.	ne is directly mals. On sor n loaded data are not
e measured. he dipole is made of standard onnected to the second arm of f the dipoles, small end caps a ccording to the position as exp ffected by this change. The ov- lo excessive force must be app onnections near the feedpoint	semirigid coaxial cable. The cen I the dipole. The antenna is there are added to the dipole arms in or plained in the "Measurement Con erall dipole length is still accordir plied to the dipole arms, because	ter conductor of the feeding li fore short-circuited for DC-sig der to improve matching whe ditions" paragraph. The SAR ing to the Standard.	ne is directly mals. On sor n loaded data are not
e measured. The dipole is made of standard onnected to the second arm of f the dipoles, small end caps a ccording to the position as exp ffected by this change. The over to excessive force must be app onnections near the feedpoint	semirigid coaxial cable. The cen I the dipole. The antenna is there are added to the dipole arms in or plained in the "Measurement Con erall dipole length is still accordir plied to the dipole arms, because	ter conductor of the feeding li fore short-circuited for DC-sig rder to improve matching whe ditions" paragraph. The SAR ng to the Standard. they might bend or the solde	ne is directly mals. On sor n loaded data are not
e measured. The dipole is made of standard onnected to the second arm of f the dipoles, small end caps a ccording to the position as exp ffected by this change. The over to excessive force must be app onnections near the feedpoint	semirigid coaxial cable. The cen I the dipole. The antenna is there are added to the dipole arms in or plained in the "Measurement Con erall dipole length is still accordir plied to the dipole arms, because	ter conductor of the feeding li fore short-circuited for DC-sig rder to improve matching whe ditions" paragraph. The SAR ng to the Standard. they might bend or the solde	ne is directly mals. On sor n loaded data are not
e measured. The dipole is made of standard onnected to the second arm of f the dipoles, small end caps a ccording to the position as exp ffected by this change. The over to excessive force must be app onnections near the feedpoint	semirigid coaxial cable. The cen I the dipole. The antenna is there are added to the dipole arms in or plained in the "Measurement Con erall dipole length is still accordir plied to the dipole arms, because	ter conductor of the feeding li fore short-circuited for DC-sig rder to improve matching whe ditions" paragraph. The SAR ng to the Standard. they might bend or the solde	ne is directly mals. On sor n loaded data are not
e measured. The dipole is made of standard onnected to the second arm of f the dipoles, small end caps a ccording to the position as exp ffected by this change. The over to excessive force must be app onnections near the feedpoint	semirigid coaxial cable. The cen I the dipole. The antenna is there are added to the dipole arms in or plained in the "Measurement Con erall dipole length is still accordir plied to the dipole arms, because	ter conductor of the feeding li fore short-circuited for DC-sig rder to improve matching whe ditions" paragraph. The SAR ng to the Standard. they might bend or the solde	ne is directly mals. On sor n loaded data are not
e measured. The dipole is made of standard onnected to the second arm of f the dipoles, small end caps a ccording to the position as exp ffected by this change. The over to excessive force must be app onnections near the feedpoint	semirigid coaxial cable. The cen I the dipole. The antenna is there are added to the dipole arms in or plained in the "Measurement Con erall dipole length is still accordir plied to the dipole arms, because	ter conductor of the feeding li fore short-circuited for DC-sig rder to improve matching whe ditions" paragraph. The SAR ng to the Standard. they might bend or the solde	ne is directly mals. On sor n loaded data are not
e measured. The dipole is made of standard onnected to the second arm of f the dipoles, small end caps a ccording to the position as exp ffected by this change. The over to excessive force must be app onnections near the feedpoint	semirigid coaxial cable. The cen I the dipole. The antenna is there are added to the dipole arms in or plained in the "Measurement Con erall dipole length is still accordir plied to the dipole arms, because	ter conductor of the feeding li fore short-circuited for DC-sig rder to improve matching whe ditions" paragraph. The SAR ng to the Standard. they might bend or the solde	ne is directly mals. On sor n loaded data are not
e measured. The dipole is made of standard onnected to the second arm of f the dipoles, small end caps a ccording to the position as exp ffected by this change. The over to excessive force must be app onnections near the feedpoint	semirigid coaxial cable. The cen I the dipole. The antenna is there are added to the dipole arms in or plained in the "Measurement Con erall dipole length is still accordir plied to the dipole arms, because	ter conductor of the feeding li fore short-circuited for DC-sig rder to improve matching whe ditions" paragraph. The SAR ng to the Standard. they might bend or the solde	ne is directly mals. On sor n loaded data are not



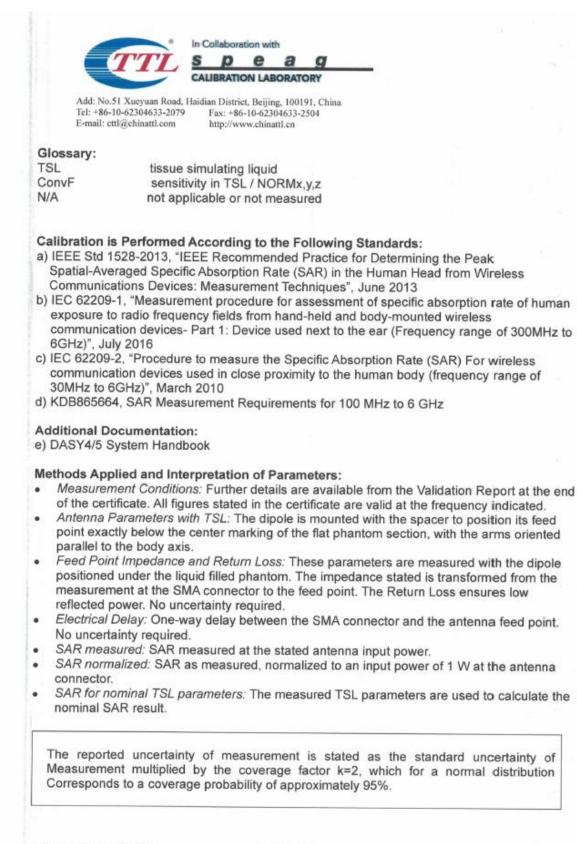


Referring to KDB865664 D01, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

			Head-835			
Date of	Doturn loop (dD)	Dolta $(9/)$	Real Impedance	Delta	Imaginary	Delta
measurement	Return-loss (dB)	Delta (%)	(ohm)	(ohm)	impedance (ohm)	(ohm)
2022-01-22	-27.6		51.5		-3.95	
2022-01-17	-27.3	1.09	51.8	0.3	-3.45	0.5

1.3. D1750V2 Dipole Calibration Certificate

E-mail: cttl@china	attl.com http	://www.chinattl.cn	CNAS L0570
Client HTW		Certificate No: Z2	1-60018
CALIBRATION C	ERTIFICA	TE	A States
Object	D175	0V2 - SN: 1164	
Calibration Procedure(s)			
		1-003-01 ration Procedures for dipole validation kits	
Calibration date:	Janua	ary 22, 2021	
pages and are part of the c	ertificate.	d the uncertainties with confidence probability	y are given on the following
uumidity<70%. Calibration Equipment usec		the closed laboratory facility: environmen for calibration) Cal Date(Calibrated by, Certificate No.) 12-May-20 (CTTL, No.J20X02965) 12-May-20 (CTTL, No.J20X02965)	t temperature(22±3)℃ and Scheduled Calibration May-21 May-21
umidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4	I (M&TE critical ID # 106276	for calibration) Cal Date(Calibrated by, Certificate No.) 12-May-20 (CTTL, No.J20X02965)	Scheduled Calibration May-21
umidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4	ID # 106276 101369 SN 7600	for calibration) Cal Date(Calibrated by, Certificate No.) 12-May-20 (CTTL, No.J20X02965) 12-May-20 (CTTL, No.J20X02965) 30-Nov-20(CTTL-SPEAG,No.Z20-60421)	Scheduled Calibration May-21 May-21 Nov-21
aumidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C	ID # 106276 101369 SN 7600 SN 771	for calibration) Cal Date(Calibrated by, Certificate No.) 12-May-20 (CTTL, No.J20X02965) 12-May-20 (CTTL, No.J20X02965) 30-Nov-20(CTTL-SPEAG,No.Z20-60421) 10-Feb-20(CTTL-SPEAG,No.Z20-60017) Cal Date(Calibrated by, Certificate No.) 25-Feb-20 (CTTL, No.J20X00516)	Scheduled Calibration May-21 May-21 Nov-21 Feb-21
aumidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C	ID# 106276 101369 SN 7600 SN 771 ID# MY49071430 MY46110673	for calibration) Cal Date(Calibrated by, Certificate No.) 12-May-20 (CTTL, No.J20X02965) 12-May-20 (CTTL, No.J20X02965) 30-Nov-20(CTTL-SPEAG,No.Z20-60421) 10-Feb-20(CTTL-SPEAG,No.Z20-60017) Cal Date(Calibrated by, Certificate No.) 25-Feb-20 (CTTL, No.J20X00516) 10-Feb-20 (CTTL, No.J20X00515)	Scheduled Calibration May-21 May-21 Nov-21 Feb-21 Scheduled Calibration Feb-21 Feb-21
aumidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C	ID # 106276 101369 SN 7600 SN 771 ID # MY49071430	for calibration) Cal Date(Calibrated by, Certificate No.) 12-May-20 (CTTL, No.J20X02965) 12-May-20 (CTTL, No.J20X02965) 30-Nov-20(CTTL-SPEAG,No.Z20-60421) 10-Feb-20(CTTL-SPEAG,No.Z20-60017) Cal Date(Calibrated by, Certificate No.) 25-Feb-20 (CTTL, No.J20X00516)	Scheduled Calibration May-21 May-21 Nov-21 Feb-21 Scheduled Calibration Feb-21
numidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2	ID # 106276 101369 SN 7600 SN 771 ID # MY49071430 MY46110673 Name	for calibration) Cal Date(Calibrated by, Certificate No.) 12-May-20 (CTTL, No.J20X02965) 12-May-20 (CTTL, No.J20X02965) 30-Nov-20(CTTL-SPEAG,No.Z20-60421) 10-Feb-20(CTTL-SPEAG,No.Z20-60017) Cal Date(Calibrated by, Certificate No.) 25-Feb-20 (CTTL, No.J20X00516) 10-Feb-20 (CTTL, No.J20X00515) Function	Scheduled Calibration May-21 May-21 Nov-21 Feb-21 Scheduled Calibration Feb-21 Feb-21
aumidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C	ID # 106276 101369 SN 7600 SN 771 ID # MY49071430 MY46110673 Name Zhao Jing	for calibration) Cal Date(Calibrated by, Certificate No.) 12-May-20 (CTTL, No.J20X02965) 12-May-20 (CTTL, No.J20X02965) 30-Nov-20(CTTL-SPEAG,No.Z20-60421) 10-Feb-20(CTTL-SPEAG,No.Z20-60017) Cal Date(Calibrated by, Certificate No.) Cal Date(Ca	Scheduled Calibration May-21 May-21 Nov-21 Feb-21 Scheduled Calibration Feb-21 Feb-21



Certificate No: Z21-60018

Page 2 of 6

DASY system configuration, as far DASY Version	as not given of	n naga 1			
DAST version		DASY52			V52.10.4
Extrapolation	Advand	ced Extrapolation			
Phantom		Flat Phantom 5.1C			
Distance Dipole Center - TSL		10 mm			with Spacer
Zoom Scan Resolution	dy	dy. dz = 5 mm			inin opeoer
Frequency		60 MHz ± 1 MHz			
The following parameters and calcu		Temperature	Permitti	ivity	
	lations were a	nnlied			
		Temperature		ivity	Conductivity
Nominal Head TSL parameters		Temperature 22.0 °C	40.1		1.37 mho/m
Nominal Head TSL parameters Measured Head TSL parameter	\$	Temperature 22.0 °C (22.0 ± 0.2) °C			
Nominal Head TSL parameters	\$	Temperature 22.0 °C	40.1		1.37 mho/m
Nominal Head TSL parameters Measured Head TSL parameter Head TSL temperature change	s during test	Temperature 22.0 °C (22.0 ± 0.2) °C	40.1 39.8 ± (1.37 mho/m
Nominal Head TSL parameters Measured Head TSL parameter Head TSL temperature change SAR result with Head TSL	s during test	Temperature 22.0 °C (22.0 ± 0.2) °C <1.0 °C	40.1 39.8 ± (1.37 mho/m
Nominal Head TSL parameters Measured Head TSL parameter Head TSL temperature change SAR result with Head TSL SAR averaged over 1 cm ³ (1 g)	s during test of Head TSL	Temperature 22.0 °C (22.0 ± 0.2) °C <1.0 °C	40.1 39.8 ± (6 %	1.37 mho/m 1.37 mho/m ± 6
Nominal Head TSL parameters Measured Head TSL parameter Head TSL temperature change SAR result with Head TSL SAR averaged over 1 cm ³ (1 g) SAR measured	s during test of Head TSL neters	Temperature 22.0 °C (22.0 ± 0.2) °C <1.0 °C	40.1 39.8 ± (tion put power d to 1W	6 %	1.37 mho/m 1.37 mho/m ± 6 9.13 W/kg
Nominal Head TSL parameters Measured Head TSL parameter Head TSL temperature change SAR result with Head TSL SAR averaged over 1 cm ³ (1 g) SAR measured SAR for nominal Head TSL param	s during test of Head TSL neters	Temperature 22.0 °C (22.0 ± 0.2) °C <1.0 °C	40.1 39.8 ± 0 tion put power d to 1W	6 %	1.37 mho/m 1.37 mho/m ± 6 9.13 W/kg

Certificate No: Z21-60018

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 Tel: +86-10-62304633-2079
 Fax: +86-10-62304633-2504

 E-mail: cttl@chinattl.com
 http://www.chinattl.cn

Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.9Ω- 3.86jΩ	
Return Loss	- 28.3 dB	

General Antenna Parameters and Design

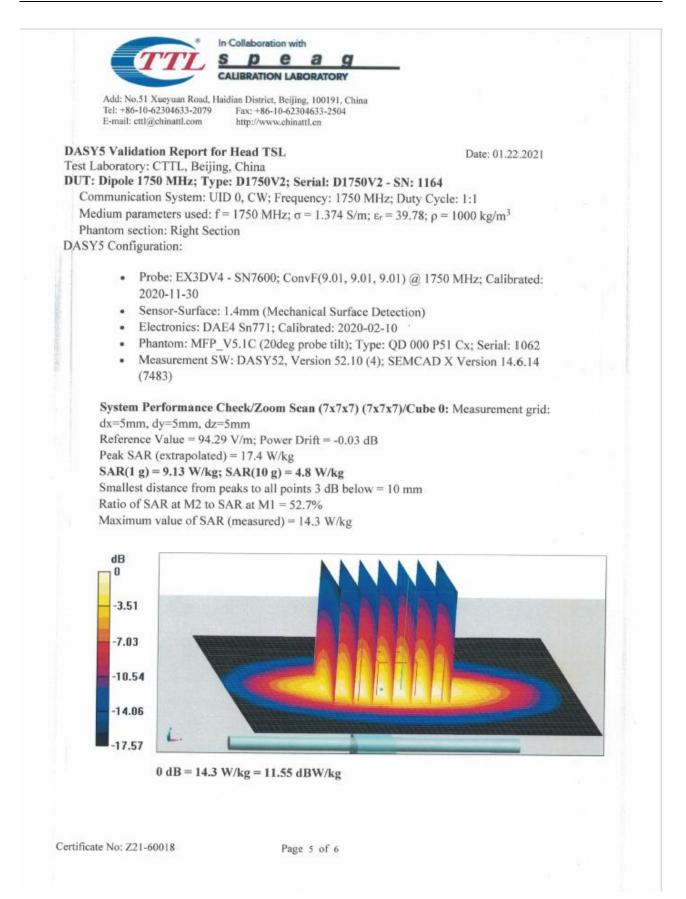
Electrical Delay (one direction)	1.124 ns
----------------------------------	----------

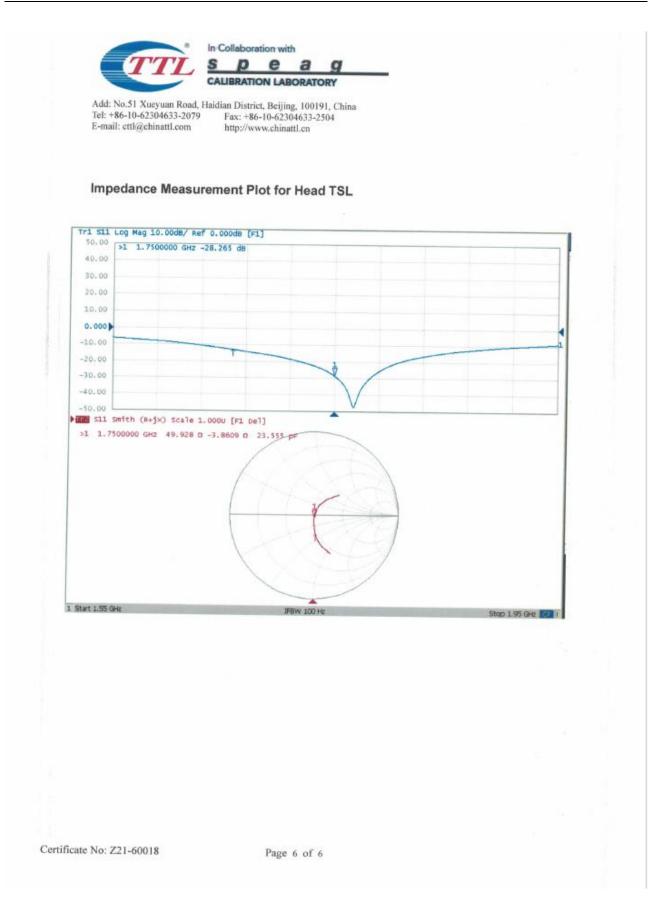
After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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	
ficate No: Z21-60018	Page 4 of 6		





Referring to KDB865664 D01, 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.

			Head-1750			
Date of	Return-loss (dB)	Delta (%)	Real Impedance	Delta	Imaginary	Delta
measurement	Return-1055 (ub)		(ohm)	(ohm)	impedance (ohm)	(ohm)
2021-01-22	-28.3		49.9		-3.86	
2022-01-17	-27.9	1.41	50.4	0.5	-3.46	0.4

1.4. D1900V2 Dipole Calibration Certificate

Client HTW	N. S. Start C					
			Certificate No: Z21	-60019		
CALIBRATION CE	RTIFICATE	Ξ				
Dbject	D1900V	2 - SN	: 5d226			
Calibration Procedure(s)	FF-Z11- Calibrati		I bocedures for dipole validation kits	idation kits		
Calibration date:	January	22, 20	021			
humidity<70%.	surements and t rtificate. conducted in t	he clo	osed laboratory facility: environment			
neasurements(SI). The mea bages and are part of the cer All calibrations have been numidity<70%. Calibration Equipment used Primary Standards	surements and t rtificate. conducted in t	he clo or calib Cal	osed laboratory facility: environment	temperature(22±3)°C and Scheduled Calibration May-21		
neasurements(SI). The mea bages and are part of the cer All calibrations have been numidity<70%. Calibration Equipment used	surements and t rtificate. conducted in t (M&TE critical fo ID #	ne clo or calib Cal 12-M 12-M 30-N	osed laboratory facility: environment pration) Date(Calibrated by, Certificate No.)	temperature(22±3)°C and Scheduled Calibration		
neasurements(SI). The mea bages and are part of the cer All calibrations have been numidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4	surements and t rtificate. conducted in t (M&TE critical for ID # 106276 101369 SN 7600 SN 771	ne clo or calib Cal 12-M 12-M 30-N 10-F	Dised laboratory facility: environment pration) Date(Calibrated by, Certificate No.) lay-20 (CTTL, No.J20X02965) lay-20 (CTTL, No.J20X02965) lov-20(CTTL-SPEAG,No.Z20-60421) reb-20(CTTL-SPEAG,No.Z20-60017)	temperature(22±3)°C and Scheduled Calibration May-21 May-21 Nov-21		
neasurements(SI). The mea bages and are part of the cer All calibrations have been numidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4	ISUREMENTS and t rtificate. conducted in t (M&TE critical for ID # 106276 101369 SN 7600 SN 771 ID # ID # MY49071430	ne clo or calib 12-M 12-M 30-N 10-F Cal I 25-F	Desed laboratory facility: environment pration) Date(Calibrated by, Certificate No.) 1ay-20 (CTTL, No.J20X02965) 1ay-20 (CTTL, No.J20X02965) Iov-20(CTTL-SPEAG,No.Z20-60421)	temperature(22±3)°C and Scheduled Calibration May-21 May-21 Nov-21 Feb-21		
neasurements(SI). The mea bages and are part of the cer All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C	ISUREMENTS and the strifticate. Conducted in the strifticate of the s	ne clo or calib 12-M 12-M 30-N 10-F Cal I 25-F	based laboratory facility: environment pration) Date(Calibrated by, Certificate No.) tay-20 (CTTL, No.J20X02965) tay-20 (CTTL, No.J20X02965) tov-20(CTTL-SPEAG,No.Z20-60421) reb-20(CTTL-SPEAG,No.Z20-60017) Date(Calibrated by, Certificate No.) Feb-20 (CTTL, No.J20X00516)	temperature(22±3)°C and Scheduled Calibration May-21 May-21 Nov-21 Feb-21 Scheduled Calibration Feb-21		
neasurements(SI). The mea bages and are part of the cer All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C	ISUREMENTS and t rtificate. conducted in t (M&TE critical for ID # 106276 101369 SN 7600 SN 771 ID # ID # MY49071430	ne clo or calib 12-M 12-M 30-N 10-F Cal I 25-F	Date(Calibrated by, Certificate No.) May-20 (CTTL, No.J20X02965) May-20 (CTTL, No.J20X02965) Mov-20(CTTL-SPEAG,No.Z20-60421) reb-20(CTTL-SPEAG,No.Z20-60017) Date(Calibrated by, Certificate No.) Feb-20 (CTTL, No.J20X00516) Feb-20 (CTTL, No.J20X00515)	temperature(22±3)°C and Scheduled Calibration May-21 May-21 Nov-21 Feb-21 Scheduled Calibration Feb-21 Feb-21		
neasurements(SI). The mea bages and are part of the cer All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C	ISUREMENTS and the strifficate. Conducted in the strifficate of the s	ne clo or calib 12-M 12-M 30-N 10-F Cal I 25-F	Date(Calibrated by, Certificate No.) May-20 (CTTL, No.J20X02965) May-20 (CTTL, No.J20X02965) May-20 (CTTL-SPEAG,No.Z20-60421) eb-20(CTTL-SPEAG,No.Z20-60017) Date(Calibrated by, Certificate No.) Feb-20 (CTTL, No.J20X00516) Feb-20 (CTTL, No.J20X00515) Function	temperature(22±3)°C and Scheduled Calibration May-21 May-21 Nov-21 Feb-21 Scheduled Calibration Feb-21 Feb-21		



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lossary:

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

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- d) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Certificate No: Z21-60019

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Measurement Conditions

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

 DASY Version
 DASY52

 V52.10.4

 Extrapolation

 Phantom

 Triple Flat Phantom 5.1C

 Distance Dipole Center - TSL

 10 mm

Head TSL parameters

Frequency

Zoom Scan Resolution

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.1 ± 6 %	1.38 mlho/m ± 6 %
Head TSL temperature change during test	<1.0 °C		

dx, dy, dz = 5 mm

1900 MHz ± 1 MHz

SAR result with Head TSL

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

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 Tel: +86-10-62304633-2079
 Fax: +86-10-62304633-2504

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

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

General Antenna Parameters and Design

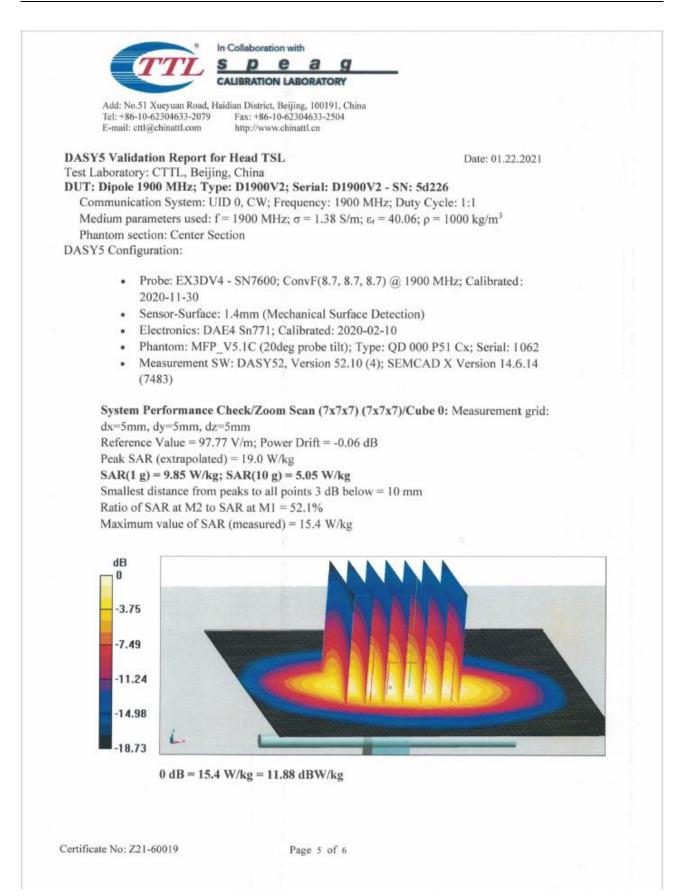
Electrical Delay (one direction)	1.102 ns	
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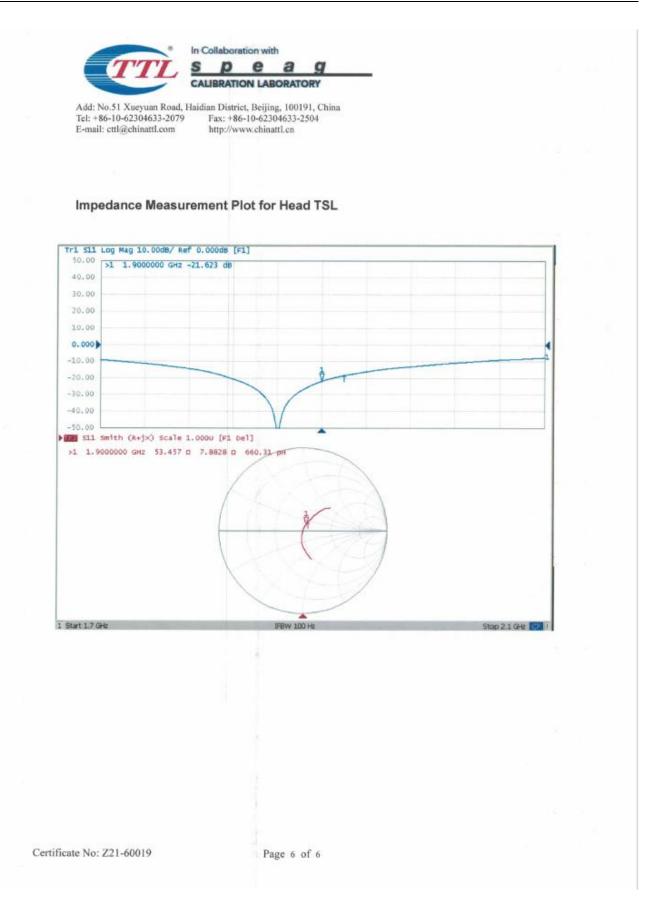
After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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	
icate No: Z21-60019	Page 4 of 6		
reate 140, 2,21-00019	rage 4 01 6		





Referring to KDB865664 D01, 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.

			Head-1900			
Date of	Doturn loop (dP)	Dolto (9/)	Real Impedance	Delta	Imaginary	Delta
measurement	Return-loss (dB)	Delta (%)	(ohm)	(ohm)	impedance (ohm)	(ohm)
2021-01-22	-21.6		53.5		7.88	
2022-01-17	-22.4	-3.70	53.9	0.4	4.35	0.53

1.5. D2450V2 Dipole Calibration Certificate

		ON LABORATORY	Hac-MRA	GIVA	う 校准 CALIBRATION
Tel: +86-10-62304633	5-2079 Fax: +8	ct, Beijing, 100191, China 6-10-62304633-2504 ww.chinattl.cn	Maladaladate		CNAS L0570
E-mail: cttl@chinattl.	com nup.//w		ertificate No:	Z21-60020)
Client	DTICICATI	ALS SERVER		33.00	
CALIBRATION CE	RTIFICATI	Constant and		and the second	
Dbject	D2450V	2 - SN: 1009			
					_
Calibration Procedure(s)	FF-Z11-		anto unlidetion kits		
	Calibrati	on Procedures for di	pole validation kits	,	
Calibration date:	January	25, 2021			
All calibrations have been	conducted in t	he closed laborator	y facility: environ	ment tempera	ature(22±3)°C and
All calibrations have been numidity<70%. Calibration Equipment used			y facility: environ		
numidity<70%.		or calibration) Cal Date(Calibrate	d by, Certificate N		duled Calibration
numidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2	(M&TE critical fo ID # 106276	or calibration) Cal Date(Calibrate 12-May-20 (CTTL, I	d by, Certificate N No.J20X02965)		duled Calibration May-21
numidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A	(M&TE critical fo ID # 106276 101369	Cal Date(Calibrate 12-May-20 (CTTL, I 12-May-20 (CTTL, I	d by, Certificate N No.J20X02965) No.J20X02965)	o.) Scheo	duled Calibration
numidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2	(M&TE critical fo ID # 106276	or calibration) Cal Date(Calibrate 12-May-20 (CTTL, I	d by, Certificate N No.J20X02965) No.J20X02965) PEAG,No.Z20-604	o.) Scher 421)	duled Calibration May-21 May-21
numidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4	(M&TE critical fo ID # 106276 101369 SN 7600 SN 771	or calibration) Cal Date(Calibrate 12-May-20 (CTTL, 1 12-May-20 (CTTL, 1 30-Nov-20(CTTL-SI 10-Feb-20(CTTL-SI	d by, Certificate N No.J20X02965) No.J20X02965) PEAG,No.Z20-600 PEAG,No.Z20-600	o.) Sched 421) 017)	duled Calibration May-21 May-21 Nov-21 Feb-21
numidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 Secondary Standards	(M&TE critical fo ID # 106276 101369 SN 7600 SN 771 ID #	Cal Date(Calibrate 12-May-20 (CTTL, I 12-May-20 (CTTL, I 30-Nov-20(CTTL-Si 10-Feb-20(CTTL-Si Cal Date(Calibrated	d by, Certificate N No.J20X02965) No.J20X02965) PEAG,No.Z20-604 PEAG,No.Z20-604 d by, Certificate No	o.) Sched 421) 017)	duled Calibration May-21 May-21 Nov-21
numidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4	(M&TE critical fo ID # 106276 101369 SN 7600 SN 771 ID # MY49071430	or calibration) Cal Date(Calibrate 12-May-20 (CTTL, 1 12-May-20 (CTTL, 1 30-Nov-20(CTTL-SI 10-Feb-20(CTTL-SI	d by, Certificate N No.J20X02965) No.J20X02965) PEAG,No.Z20-604 PEAG,No.Z20-604 d by, Certificate No No.J20X00516)	o.) Sched 421) 017)	duled Calibration May-21 May-21 Nov-21 Feb-21 duled Calibration
numidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C	(M&TE critical fo ID # 106276 101369 SN 7600 SN 771 ID # MY49071430	Cal Date(Calibrate 12-May-20 (CTTL, 1 12-May-20 (CTTL, 1 30-Nov-20(CTTL-SI 10-Feb-20(CTTL-SI Cal Date(Calibrated 25-Feb-20 (CTTL, 1	d by, Certificate N No.J20X02965) No.J20X02965) PEAG,No.Z20-604 PEAG,No.Z20-604 d by, Certificate No No.J20X00516)	o.) Sched 421) 017) 5.) Sche	duled Calibration May-21 May-21 Nov-21 Feb-21 duled Calibration Feb-21
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 Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China

 Tel: +86-10-62304633-2079
 Fax: +86-10-62304633-2504

 E-mail: cttl@chinattl.com
 http://www.chinattl.cn

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%.

Certificate No: Z21-60020

Page 2 of 6



 Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China

 Tel: +86-10-62304633-2079
 Fax: +86-10-62304633-2504

 E-mail: cttl@chinattl.com
 http://www.chinattl.cn

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	2450 MHz ± 1 MHz	

Head TSL parameters

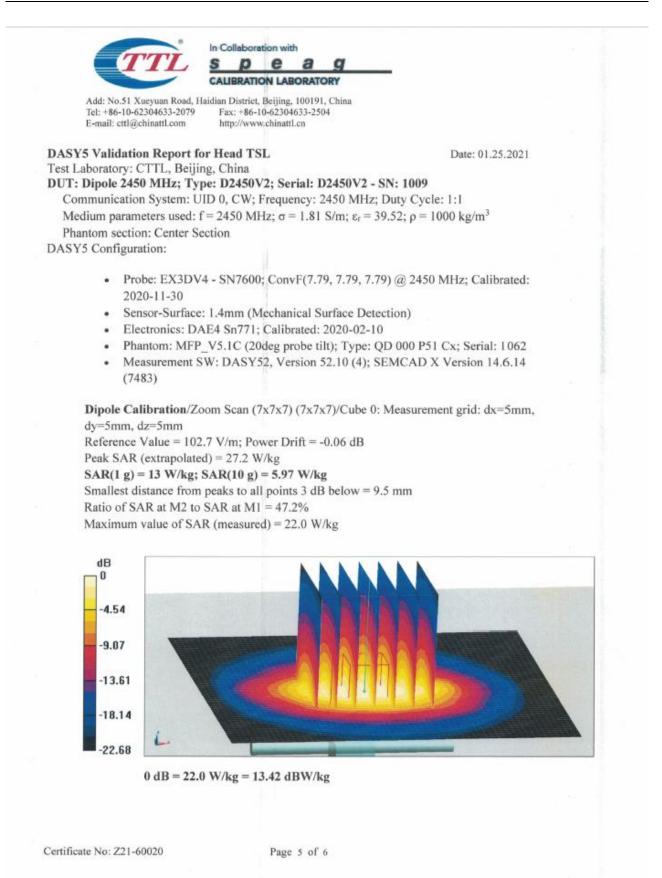
The following parameters and calculations were applied.

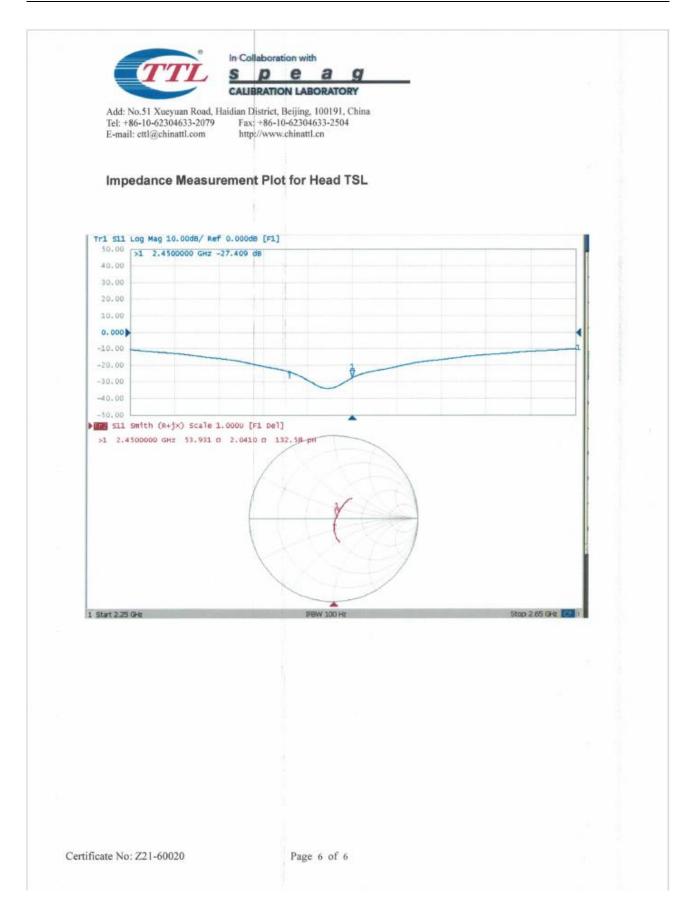
	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.5 ± 6 %	1.81 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C		

SAR result with Head TSL

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

Tel: +86-10-62304633-2079 E-mail: cttl@chinattl.com	lian District, Beijing, 100191, Ch Fax: +86-10-62304633-2504 http://www.chinattl.cn	ina	
E-man. curacoman.com	http://www.canaati.ca		
Appendix (Additional asse	ssments outside the	scope of CNAS L0570)	
Antenna Parameters with I	Head TSL		
Impedance, transformed to feed	1 point	53.9Ω+ 2.04jΩ	
Return Loss		- 27.4dB	
General Antenna Paramete	are and Docion		
General Antenna Faramete	ers and Design		
Electrical Delay (one direction)	1	1.064 ns	
After long term use with 10014/ rs	dicted newer only a cligh	twoming of the dipole poor the l	foodpoint con
be measured.	adiated power, only a sligr	t warming of the dipole near the f	reedpoint can
		e center conductor of the feeding	
connected to the second arm of t			
		therefore short-circuited for DC-s s in order to improve matching wi	
of the dipoles, small end caps an according to the position as expli	e added to the dipole arm ained in the "Measuremer	s in order to improve matching wind to a second to a s	nen loaded
of the dipoles, small end caps an according to the position as expli- affected by this change. The ove No excessive force must be appl	e added to the dipole arm ained in the "Measuremer rall dipole length is still ac lied to the dipole arms, be	s in order to improve matching wind to a second to a s	nen loaded R data are not
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Referring to KDB865664 D01, 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.

			Head-2450			
Date of	Doturn loop (dD)	Delta (%)	Real Impedance	Delta	Imaginary	Delta
measurement	Return-loss (dB)		(ohm)	(ohm)	impedance (ohm)	(ohm)
2021-01-25	-27.4		53.9		2.04	
2022-01-17	-27.9	-1.82	53.5	0.4	2.34	0.3

1.6. D2600V2 Dipole Calibration Certificate

Add: No.51 Xueyuan Ro Tel: +86-10-62304633- E-mail: cttl@chinatl.	2079 Fax: +80-	w.chinattl.cn	-60021
Client HTW		THE FREE PROPERTY STATES	Carl States
CALIBRATION CER	TIFICATE		
Dbject	D2600V2	2 - SN: 1150	
Calibration Procedure(s)	FF-Z11-0 Calibratio	003-01 on Procedures for dipole validation kits	111
Calibration date:	January	25, 2021	17111
All calibrations have been of	conducted in th	he closed laboratory facility: environment	(emperature(exce) -
All calibrations have been of humidity<70%. Calibration Equipment used (r calibration)	
humidity<70%. Calibration Equipment used (or calibration) Cal Date(Calibrated by, Certificate No.)	Scheduled Calibratio
humidity<70%.	M&TE critical fo	r calibration)	
humidity<70%. Calibration Equipment used (Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4	M&TE critical fo ID # 106276 101369 SN 7600 SN 771	Cal Date(Calibrated by, Certificate No.) 12-May-20 (CTTL, No.J20X02965) 12-May-20 (CTTL, No.J20X02965) 30-Nov-20(CTTL-SPEAG,No.Z20-60421) 10-Feb-20(CTTL-SPEAG,No.Z20-60017)	Scheduled Calibratio May-21 May-21 Nov-21 Feb-21 Scheduled Calibratio
humidity<70%. Calibration Equipment used (Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4	M&TE critical fo ID # 106276 101369 SN 7600	Cal Date(Calibrated by, Certificate No.) 12-May-20 (CTTL, No.J20X02965) 12-May-20 (CTTL, No.J20X02965) 30-Nov-20(CTTL-SPEAG,No.Z20-60421)	Scheduled Calibratio May-21 May-21 Nov-21 Feb-21
humidity<70%. Calibration Equipment used (Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C	M&TE critical fo ID # 106276 101369 SN 7600 SN 771 ID # MY49071430 MY46110673	Cal Date(Calibrated by, Certificate No.) 12-May-20 (CTTL, No.J20X02965) 12-May-20 (CTTL, No.J20X02965) 30-Nov-20(CTTL-SPEAG,No.Z20-60421) 10-Feb-20(CTTL-SPEAG,No.Z20-60017) Cal Date(Calibrated by, Certificate No.) 25-Feb-20 (CTTL, No.J20X00516)	Scheduled Calibratio May-21 May-21 Nov-21 Feb-21 Scheduled Calibratio Feb-21
humidity<70%. Calibration Equipment used (Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C	M&TE critical fo ID # 106276 101369 SN 7600 SN 771 ID # MY49071430	Cal Date(Calibrated by, Certificate No.) 12-May-20 (CTTL, No.J20X02965) 12-May-20 (CTTL, No.J20X02965) 30-Nov-20(CTTL-SPEAG,No.Z20-60421) 10-Feb-20(CTTL-SPEAG,No.Z20-60017) Cal Date(Calibrated by, Certificate No.) 25-Feb-20 (CTTL, No.J20X00516) 10-Feb-20 (CTTL, No.J20X00515)	Scheduled Calibratio May-21 May-21 Nov-21 Feb-21 Scheduled Calibratio Feb-21 Feb-21
humidity<70%. Calibration Equipment used (Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C Network Analyzer E5071C	M&TE critical fo ID # 106276 101369 SN 7600 SN 771 ID # MY49071430 MY46110673 Name	Cal Date(Calibrated by, Certificate No.) 12-May-20 (CTTL, No.J20X02965) 12-May-20 (CTTL, No.J20X02965) 30-Nov-20(CTTL-SPEAG,No.Z20-60421) 10-Feb-20(CTTL-SPEAG,No.Z20-60017) Cal Date(Calibrated by, Certificate No.) 25-Feb-20 (CTTL, No.J20X00516) 10-Feb-20 (CTTL, No.J20X00515) Function	Scheduled Calibratio May-21 May-21 Nov-21 Feb-21 Scheduled Calibratio Feb-21 Feb-21
humidity<70%. Calibration Equipment used (Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C Network Analyzer E5071C Calibrated by:	M&TE critical fo ID # 106276 101369 SN 7600 SN 771 ID # MY49071430 MY46110673 Name Zhao Jing	Cal Date(Calibrated by, Certificate No.) 12-May-20 (CTTL, No.J20X02965) 12-May-20 (CTTL, No.J20X02965) 30-Nov-20(CTTL-SPEAG,No.Z20-60421) 10-Feb-20(CTTL-SPEAG,No.Z20-60017) Cal Date(Calibrated by, Certificate No.) 25-Feb-20 (CTTL, No.J20X00516) 10-Feb-20 (CTTL, No.J20X00515) Function SAR Test Engineer	Scheduled Calibratio May-21 May-21 Nov-21 Feb-21 Scheduled Calibratio Feb-21 Feb-21



 Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China

 Tel: +86-10-62304633-2079
 Fax: +86-10-62304633-2504

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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%.

Certificate No: Z21-60021

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Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504 E-mail: cttl@chinattl.com http://www.chinattl.cn

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	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	39.7 ± 6 %	1.97 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C		

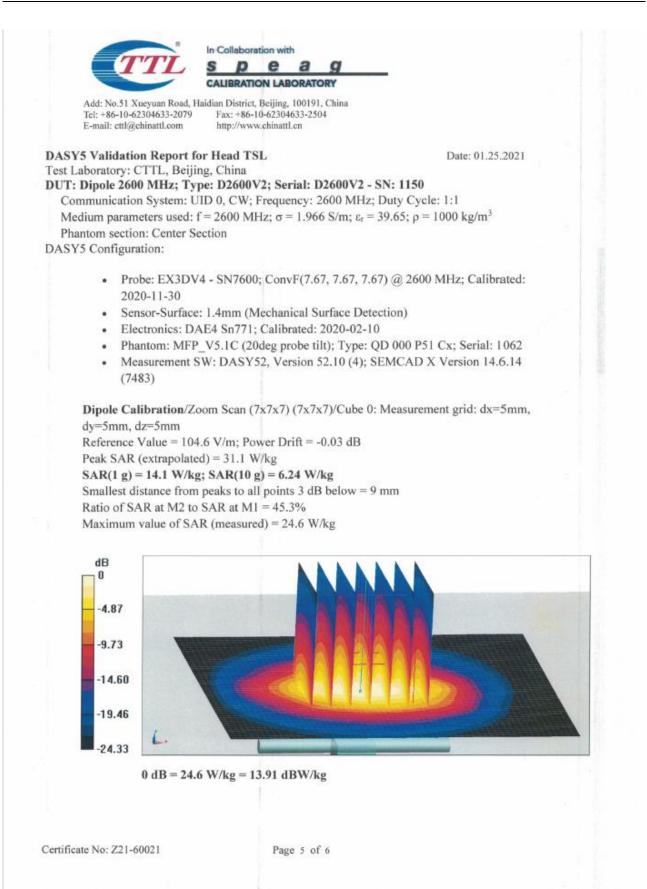
SAR result with Head TSL

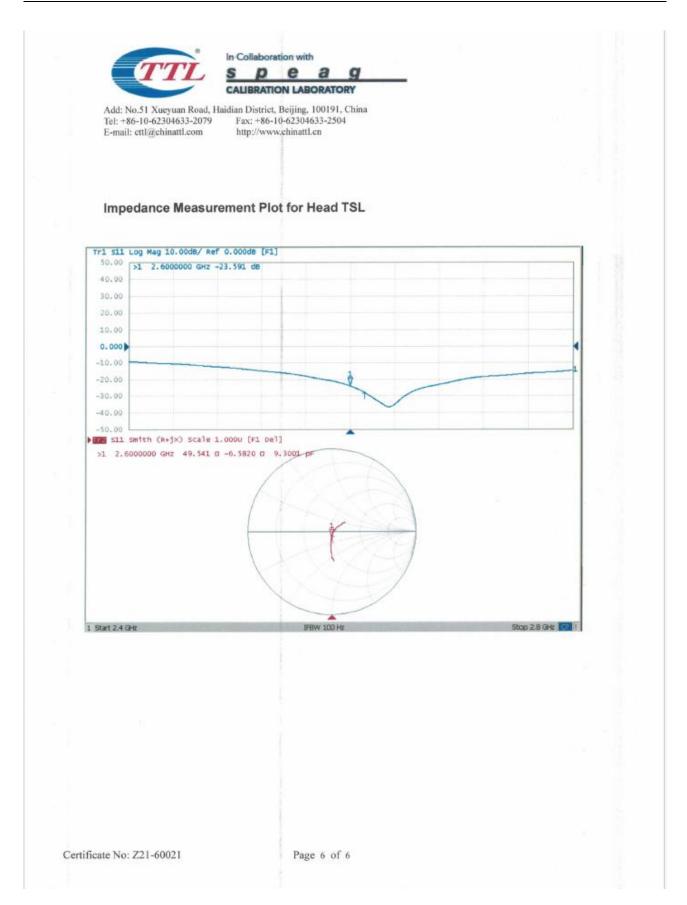
SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	14.1 W/kg 56.5 W/kg ± 18.8 % (<i>k</i> =2)	
SAR measured	250 mW input power		
SAR for nominal Head TSL parameters	normalized to 1W		
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition		
SAR measured	250 mW input power	6.24 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	25.0 W/kg ± 18.7 % (k=2)	

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Appendix(Additional asso Antenna Parameters with		the scope of CNAS L0570)
Impedance, transformed to fee	ed point	49.5Ω- 6.58jΩ
Return Loss		- 23.6dB
그는 사람이 지난 것 같아요. 이 것은 것 같아요. 이 집에서 가지 않는 것 같아요. 이 나는 것 같아요. 이 나는 것	radiated power, only a	slight warming of the dipole near the feedpoint ca
be measured. The dipole is made of standard connected to the second arm o of the dipoles, small end caps a according to the position as exp affected by this change. The ov	semirigid coaxial cabl f the dipole. The anten are added to the dipole plained in the "Measure rerall dipole length is si plied to the dipole arm	e. The center conductor of the feeding line is direct na is therefore short-circuited for DC-signals. On earms in order to improve matching when loaded ement Conditions" paragraph. The SAR data are to
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Referring to KDB865664 D01, 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.

Head-2600						
Date of	Doturn loop (dP)	Dolto (9/)	Real Impedance	Delta	Imaginary	Delta
measurement	Return-loss (dB)) Delta (%)	(ohm)	(ohm)	impedance (ohm)	(ohm)
2022-01-25	-23.6		49.5		-6.58	
2022-01-17	-24.0	-1.69	49.1	0.4	-6.03	0.55