Appendix C: System Calibration Certificate

Calibration information for E-field probes

Add: No.52 HuaYuanBei Ro Tel: +86-10-62304633-2117		ing, 100191, China Maladada	
E-mail: emf@caict.ac.cn	http://www.caict.ac.co	n Certificate No	o: 24J02Z000003
Chern	AN CONTRACTOR OF A DURING	Certificate N	0. 245022000005
CALIBRATION CI	ERTIFICATE		
Object	EX3DV4 -	SN : 7601	
Calibration Procedure(s)	FF 744 00		
	FF-Z11-00	n Procedures for Dosimetric E-field Prot	100
	Calibration	Procedules for Dosimetric E-field Proc	203
Calibration date:	January 29	9, 2024	
This calibration Certificate docur	nents the traceability to	o national standards, which realize the physica	al units of measurements(SI). The
		robability are given on the following pages and	A 2.
All calibrations have been condu	cted in the closed labo	ratory facility: environment temperature(22±3)*	c and humidity<70%.
All calibrations have been condu	icted in the closed labo	ratory facility: environment temperature(22±3)*	c and humidity<70%.
			c and humidity<70%.
All calibrations have been condu Calibration Equipment used (M& Primary Standards	TE critical for calibratic	2 n)	c and humidity<70%.
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Certificate No: 24J02Z000003

Page 1 of 9





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Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A,B,C,D	modulation dependent linearization parameters
Polarization Φ	Φ rotation around probe axis
Polarization 0	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i
	θ=0 is normal to probe axis

Connector Angle information used in DASY system to align probe sensor X to the robot coordinate system 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 the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"
- Methods Applied and Interpretation of Parameters:
- NORMx, y,z: Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f>1800MHz: waveguide). NORMx, y,z are only intermediate values, i.e., the uncertainties of NORMx, y,z does not effect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)x, y, z = NORMx, y, z* frequency_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCPx, y,z: DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics.
- Ax, y,z; Bx, y,z; Cx, y,z; VRx, y, z:A,B,C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters: Assessed in flat phantom using E-field (or Temperature Transfer Standard for f≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORMx,y,z* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from±50MHz to±100MHz.
- Spherical isotropy (3D deviation from isotropy): in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset: The sensor offset corresponds to the offset of virtual measurement center from the
 probe tip (on probe axis). No tolerance required.
- Connector Angle: The angle is assessed using the information gained by determining the NORMx (no uncertainty required).

Certificate No:24J02Z000003

Page 2 of 9





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DASY/EASY – Parameters of Probe: EX3DV4 – SN:7601

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm(µV/(V/m) ²) ^A	0.70	0.65	0.74	±10.0%
DCP(mV) ^B	109.6	109.1	114.7	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dBõV	С	D dB	VR mV	Unc ^E (<i>k</i> =2)
0	cw	x	0.0	0.0	1.0	0.00	232.7	±2.3%
		Y	0.0	0.0	1.0		218.5	
		Z	0.0	0.0	1.0		243.0	

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%.

^A The uncertainties of Norm X, Y, Z do not affect the E²-field uncertainty inside TSL (see Page 4).

^B Numerical linearization parameter: uncertainty not required.

^E Uncertainly is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

Page 3 of 9





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DASY/EASY – Parameters of Probe: EX3DV4 – SN:7601

f [MHz] ^C	Relative Permittivity F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unct. (<i>k</i> =2)
750	41.9	0.89	10.71	10.71	10.71	0.13	1.49	±12.7%
835	41.5	0.90	10.30	10.30	10.30	0.14	1.43	±12.7%
1750	40.1	1.37	8.73	8.73	8.73	0.25	1.02	±12.7%
1900	40.0	1.40	8.44	8.44	8.44	0.28	1.00	±12.7%
2300	39.5	1.67	8.18	8.18	8.18	0.37	0.87	±12.7%
2450	39.2	1.80	7.89	7.89	7.89	0.40	0.85	±12.7%
2600	39.0	1.96	7.60	7.60	7.60	0.32	1.05	±12.7%
5250	35.9	4.71	5.51	5.51	5.51	0.45	1.40	±13.9%
5750	35.4	5.22	5.01	5.01	5.01	0.45	1.38	±13.9%

Calibration Parameter Determined in Head Tissue Simulating Media

^c Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

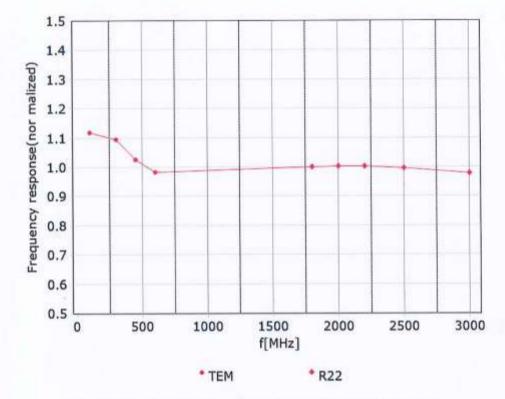
F At frequency up to 6 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

Page 4 of 9



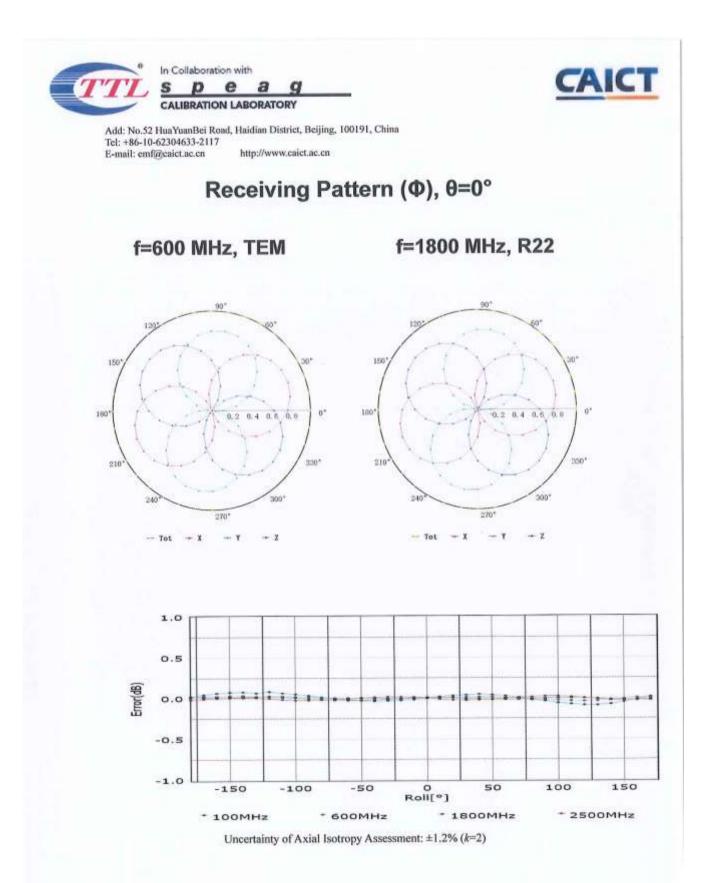
Frequency Response of E-Field (TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ±7.4% (k=2)

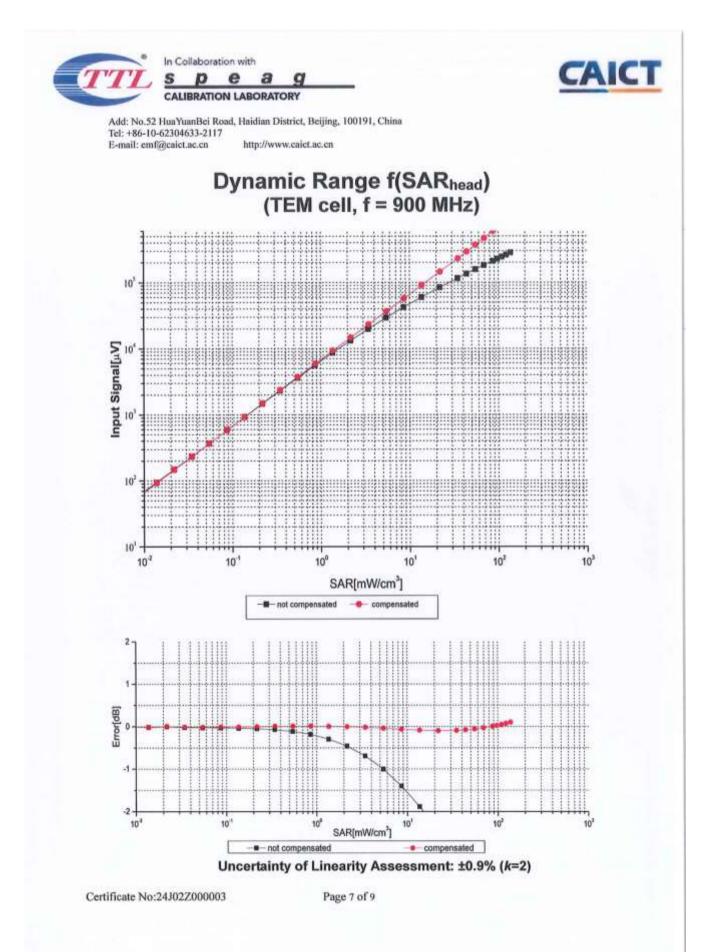
Certificate No:24J02Z000003

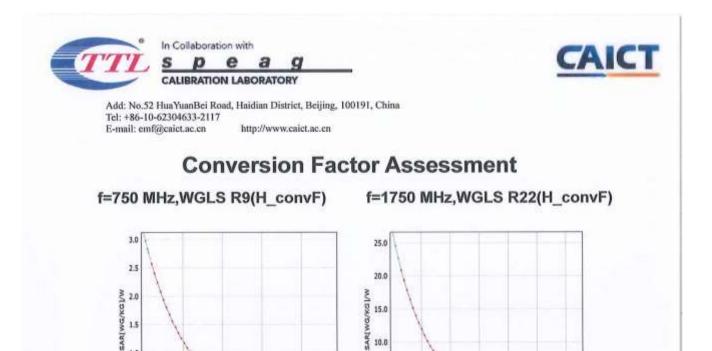
Page 5 of 9



Certificate No:24J02Z000003

Page 6 of 9





15.0

THY 10.0

5.0

ö

10

20

* analytical

30

zimm

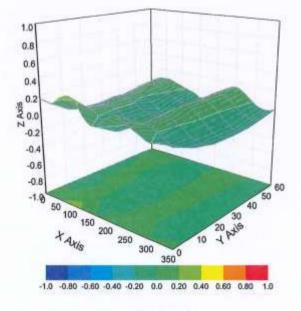
40

"measured

50

60

Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: ±3.2% (k=2)

Certificate No:24J02Z000003

1.5

1.0

0.5

0

20

40

" analytical

2[mm]

60

* measured

80

Page 8 of 9



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DASY/EASY – Parameters of Probe: EX3DV4 – SN:7601

Sensor Arrangement	Triangular
Connector Angle (°)	146.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	9mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm

Certificate No:24J02Z000003

Page 9 of 9

Calibration information for Dipole

Qi Dianyuan	SAR Project Leader	2007 -
Lin Hao	SAR Test Engineer	林治
Zhao Jing	SAR Test Engineer	20
Name	Function	Signature
MY46110673	10-Jan-23 (CTTL, No. J23X00104)	Jan-24
ID # MY49071430	Cal Date (Calibrated by, Certificate No.) 05-Jan-23 (CTTL, No. J23X00107)	Scheduled Calibration Jan-24
SN 1556	11-Jan-23(CTTL-SPEAG,No.Z23-60034)	Jan-24
SN 3617	31-Mar-23(CTTL-SPEAG,No.Z23-60161)	Mar-24
104291	22-Sep-22 (CTTL, No.J22X09561)	Sep-23
106277	22-Sep-22 (CTTL, No.J22X09561)	Sep-23
ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
(M&TE critical fo	or calibration)	
conducted in th	he closed laboratory facility: environment	temperature (22+3)°C and
	the uncertainties with confidence probability	are given on the following
	내 이 가지 않는 것 같은 것 같은 것 같은 것 같은 것을 것 것 같은 것 같이 많은 것 같이 많은 것 같은 것	사람이다. 그 같은 것이 집에서 가지 않는 것 같아요. 것이 가
May 18	, 2023	
FE 744	002.04	
D750V3	3 - SN: 1118	
RTIFICAT	E	
		3Z60249
http://www.caict		
	ERTIFICAT D750V3 FF-Z11- Calibrat May 18 documents the f asurements and rtificate. conducted in th (M&TE critical for 104291 SN 3617 SN 1556 ID # 106277 104291 SN 3617 SN 1556 ID # MY49071430 MY46110673 Name Zhao Jing Lin Hao	BTIFICATE D750V3 - SN: 1118 FF-Z11-003-01 Calibration Procedures for dipole validation kits May 18, 2023 documents the traceability to national standards, which reasurements and the uncertainties with confidence probability rificate. conducted in the closed laboratory facility: environment (M&TE critical for calibration) ID # Cal Date (Calibrated by, Certificate No.) 106277 22-Sep-22 (CTTL, No.J22X09561) SN 3617 31-Mar-23(CTTL-SPEAG,No.Z23-60034) SN 1556 11-Jan-23 (CTTL, SPEAG,No.Z23-60034) ID # Cal Date (Calibrated by, Certificate No.) MY49071430 05-Jan-23 (CTTL, No. J23X00107) MY46110673 10-Jan-23 (CTTL, No. J23X00104) Name Function Name Function Lin Hao SAR Test Engineer



In Collaboration with s e р а g CALIBRATION 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

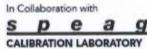
Methods Applied and Interpretation of Parameters:

- 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%.

Page 2 of 6







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Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	

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	41.3 ± 6 %	0.87 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	2.10 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.55 W/kg ± 18.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.56 W/kg ± 18.7 % (k=2)

Certificate No: J23Z60249

Page 3 of 6





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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.1Ω- 5.01jΩ	
Return Loss	- 25.9dB	

General Antenna Parameters and Design

Electrical Delay (one direction)	0.946 ns	
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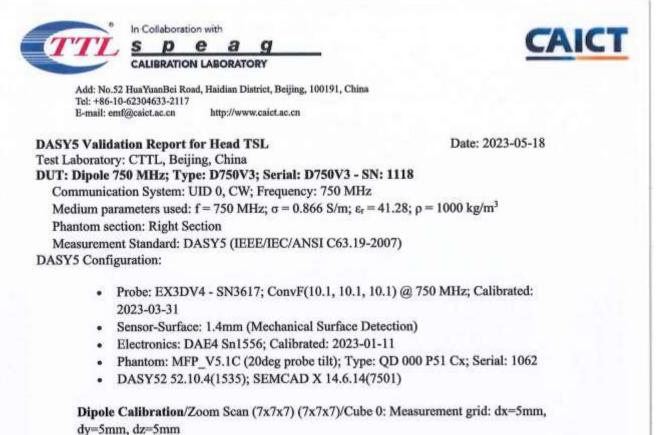
After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured.

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

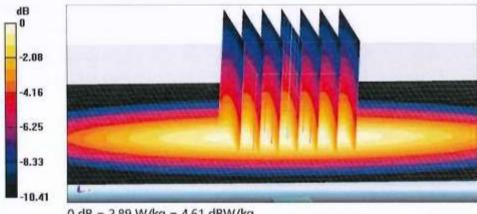
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Page 4 of 6



Reference Value = 54.03 V/m; Power Drift = -0.03 dB Peak SAR (extrapolated) = 3.36 W/kg SAR(1 g) = 2.1 W/kg; SAR(10 g) = 1.37 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 = 63.2%

Maximum value of SAR (measured) = 2.89 W/kg



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

Certificate No: J23Z60249

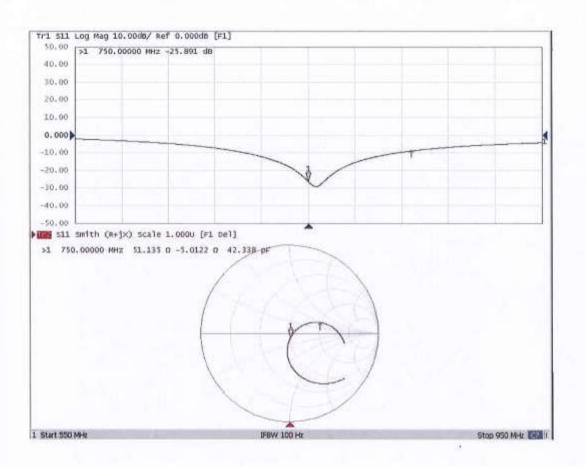
Page 5 of 6





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Impedance Measurement Plot for Head TSL



Certificate No: J23Z60249

Page 6 of 6

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191			
Client JYT	hup://www.cas		22-60210
CALIBRATION C	ERTIFICAT	Е	
Object	D835V	2 - SN: 4d154	000
Calibration Procedure(s)		-003-01 tion Procedures for dipole validation kits	
Calibration date:	June 8,		
pages and are part of the ce		the uncertainties with confidence probability	
All calibrations have been humidity<70%.	ertificate.	he closed laboratory facility: environment	
All calibrations have been humidity<70%. Calibration Equipment used	ertificate.	he closed laboratory facility: environment	
All calibrations have been numidity<70%. Calibration Equipment used	ortificate. conducted in t (M&TE critical fo	he closed laboratory facility: environment or calibration)	temperature (22±3)°C and
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S	ortificate. conducted in t (M&TE critical for ID # 106277 104291	he closed laboratory facility: environment or calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326)	temperature (22±3)°C and Scheduled Calibration
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4	ID # 106277 104291 SN 7464	he closed laboratory facility: environment or calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-Jan-22(SPEAG,No.EX3-7464_Jan22)	temperature (22±3)°C and Scheduled Calibration Sep-22 Sep-22 Jan-23
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S	ortificate. conducted in t (M&TE critical for ID # 106277 104291	he closed laboratory facility: environment or calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326)	temperature (22±3)°C and Scheduled Calibration Sep-22 Sep-22
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4	ID # 106277 104291 SN 7464	he closed laboratory facility: environment or calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-Jan-22(SPEAG,No.EX3-7464_Jan22)	temperature (22±3)°C and Scheduled Calibration Sep-22 Sep-22 Jan-23
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4	ertificate. conducted in t (M&TE critical for ID # 106277 104291 SN 7464 SN 1556	he closed laboratory facility: environment or calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-Jan-22(SPEAG,No.EX3-7464_Jan22) 12-Jan-22(CTTL-SPEAG,No.Z22-60007)	temperature (22±3)°C and Scheduled Calibration Sep-22 Sep-22 Jan-23 Jan-23
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards	ertificate. conducted in t (M&TE critical for ID # 106277 104291 SN 7464 SN 1556 ID # ID # MY49071430	he closed laboratory facility: environment or calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-Jan-22(SPEAG,No.EX3-7464_Jan22) 12-Jan-22(CTTL-SPEAG,No.Z22-60007) Cal Date (Calibrated by, Certificate No.)	temperature (22±3)°C and Scheduled Calibration Sep-22 Sep-22 Jan-23 Jan-23 Scheduled Calibration
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C	ertificate. conducted in t (M&TE critical for ID # 106277 104291 SN 7464 SN 1556 ID # ID # MY49071430	he closed laboratory facility: environment or calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-Jan-22(SPEAG,No.EX3-7464_Jan22) 12-Jan-22(CTTL-SPEAG,No.Z22-60007) Cal Date (Calibrated by, Certificate No.) 13-Jan-22 (CTTL, No.J22X00409)	temperature (22±3)°C and Scheduled Calibration Sep-22 Sep-22 Jan-23 Jan-23 Scheduled Calibration Jan-23 Jan-23
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C Network Analyzer E5071C	ertificate. conducted in t (M&TE critical for ID # 106277 104291 SN 7464 SN 1556 ID # MY49071430 MY46110673	he closed laboratory facility: environment or calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-Jan-22(SPEAG,No.EX3-7464_Jan22) 12-Jan-22(CTTL-SPEAG,No.Z22-60007) Cal Date (Calibrated by, Certificate No.) 13-Jan-22 (CTTL, No.J22X00409) 14-Jan-22 (CTTL, No.J22X00406)	temperature (22±3)°C and Scheduled Calibration Sep-22 Sep-22 Jan-23 Jan-23 Scheduled Calibration Jan-23
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C	ertificate. conducted in t (M&TE critical for 1D # 106277 104291 SN 7464 SN 1556 ID # MY49071430 MY46110673 Name	he closed laboratory facility: environment or calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-Jan-22(SPEAG,No.EX3-7464_Jan22) 12-Jan-22(CTTL-SPEAG,No.Z22-80007) Cal Date (Calibrated by, Certificate No.) 13-Jan-22 (CTTL, No.J22X00409) 14-Jan-22 (CTTL, No.J22X00406) Function	temperature (22±3)°C and Scheduled Calibration Sep-22 Sep-22 Jan-23 Jan-23 Scheduled Calibration Jan-23 Jan-23

Certificate No: Z22-60210

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) 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%.

Page 2 of 6





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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	

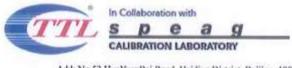
Head TSL parameters The following parameters and calculations were applied.

	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	41.9 ± 6 %	0.88 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	2.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.60 W/kg ± 18.8 % (k=2)
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	-
SAR measured	250 mW input power	1.53 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.20 W/kg ± 18.7 % (k=2)

Page 3 of 6





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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.9Ω- 3.78jΩ	
Return Loss	- 28.0dB	

General Antenna Parameters and Design

Electrical Delay (one direction)	1.310 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

Manufactured by	SPEAG
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Page 4 of 6





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DASY5 Validation Report for Head TSL Test Laboratory: CTTL, Beijing, China DUT: Dipole 835 MHz; Type: D835V2; Serial:

Date: 2022-06-08

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d154 Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1 Medium parameters used: f = 835 MHz; $\sigma = 0.882$ S/m; $\epsilon_r = 41.9$; $\rho = 1000$ kg/m³ Phantom section: Right Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

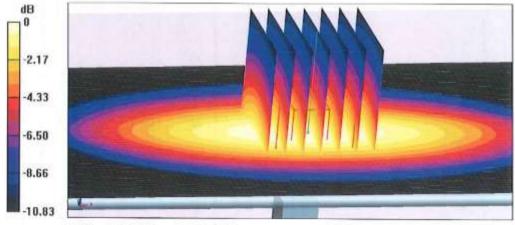
DASY5 Configuration:

- Probe: EX3DV4 SN7464; ConvF(9.96, 9.96, 9.96) @ 835 MHz; Calibrated: 2022-01-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2022-01-12
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 59.20 V/m; Power Drift = -0.01 dB Peak SAR (extrapolated) = 3.58 W/kg

SAR(1 g) = 2.36 W/kg; SAR(10 g) = 1.53 W/kg Smallest distance from peaks to all points 3 dB below = 18 mm Ratio of SAR at M2 to SAR at M1 = 65.7%





0 dB = 3.17 W/kg = 5.01 dBW/kg

Certificate No: Z22-60210

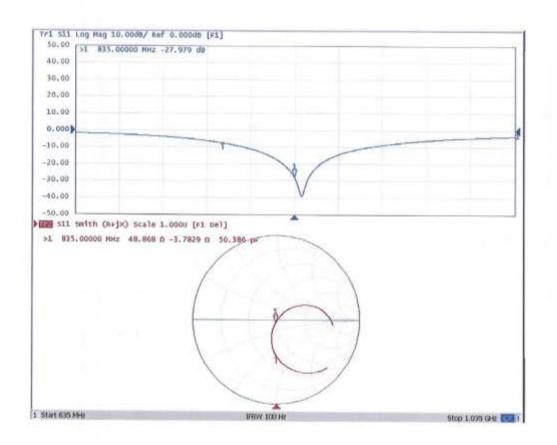
Page 5 of 6





Impedance Measurement Plot for Head TSL

http://www.caict.ac.en



Page 6 of 6

Dipole Impedance and Return Loss Check Report

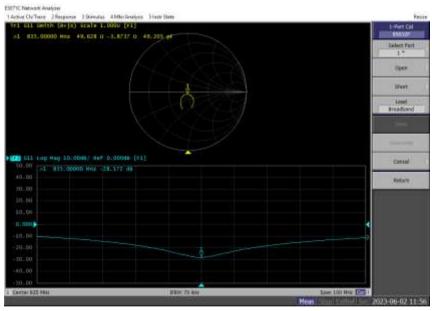
Object:	D835V2 - SN: 4d157
Check Date:	June 02, 2023
Check reference:	IEC/IEEE 62209-1528:2020, FCC KDB 865664 D01
Checked By:	Janet Wei (Janet Wei, SAR project engineer)
Reviewed By:	Winner Zhang, Technical manager)

Environment of Test Site

Temperature:	21 ~ 23°C
Humidity:	50~60% RH
Atmospheric Pressure:	1011 mbar

Test Data

Measurement Plot for Head TSL In 2023



Comparison with Original report

Items	Checked By JYT In 2022	Checked By JYT In 2023	Deviation	Limit
Impendence for Head TSL	52.42Ω -1.46jΩ	49.63Ω -3.87jΩ	-2.79Ω -2.41jΩ	±5Ω
Return Loss for Head TSL	-31.17	-28.17	-9.62%	±20%(No less than 20 dB)

Result

Compliance

Add: No.52 HuaYuanBei Roa Tel: +86-10-62304633-2117 E-mail: emf@caict.ac.cn	d, Haidian District, I		L0570
Client JYT	and a second second		02Z00008
CALIBRATION CE	RTIFICAT	Έ	
Object	D1750	/2 - SN: 1177	
Calibration Procedure(s)	FF-Z11 Calibra	-003-01 tion Procedures for dipole validation kits	
Calibration date:	Januar	y 17, 2024	
measurements (SI). The mea	asurements and	traceability to national standards, which reali the uncertainties with confidence probability a	
measurements (SI). The mea pages and are part of the ce All calibrations have been humidity<70%.	asurements and rtificate. conducted in t	I the uncertainties with confidence probability a the closed laboratory facility: environment te	re given on the following
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neasurements (SI). The mea bages and are part of the cer All calibrations have been numidity<70%. Calibration Equipment used	asurements and rtificate. conducted in t	I the uncertainties with confidence probability a the closed laboratory facility: environment te	re given on the following
neasurements (SI). The mea bages and are part of the ce NI calibrations have been humidity<70%. Calibration Equipment used Primary Standards	asurements and rtificate. conducted in t (M&TE critical f	the uncertainties with confidence probability a the closed laboratory facility: environment te or calibration) Cal Date (Calibrated by, Certificate No.)	re given on the following mperature (22±3)°C and Scheduled Calibration
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Certificate No: 24J02Z000008





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a

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:

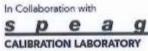
- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the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

Certificate No: 24J02Z000008

Page 2 of 6







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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	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 %	1.39 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	9.23 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	4.90 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.4 W/kg ± 18.7 % (k=2)

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Page 3 of 6





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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	46.4Ω- 2.03jΩ	
Return Loss	- 27.4dB	

General Antenna Parameters and Design

Electrical Delay (one direction)	1.122 ns	
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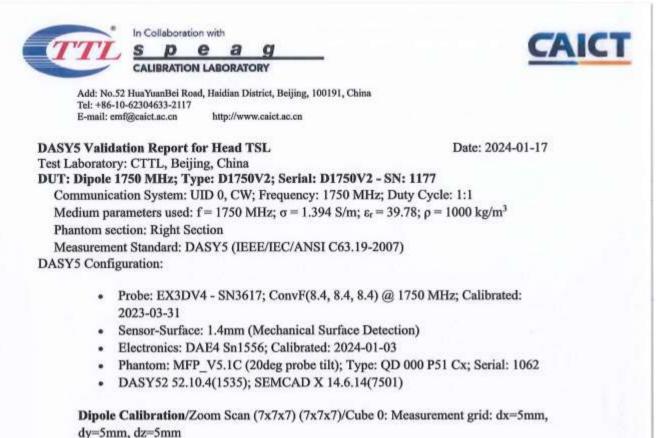
After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured.

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.

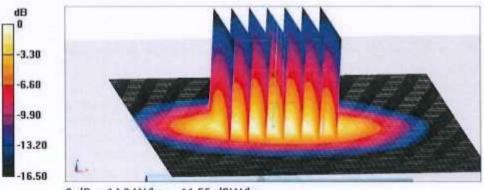
Additional EUT Data

Manufactured by	SPEAG
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Page 4 of 6



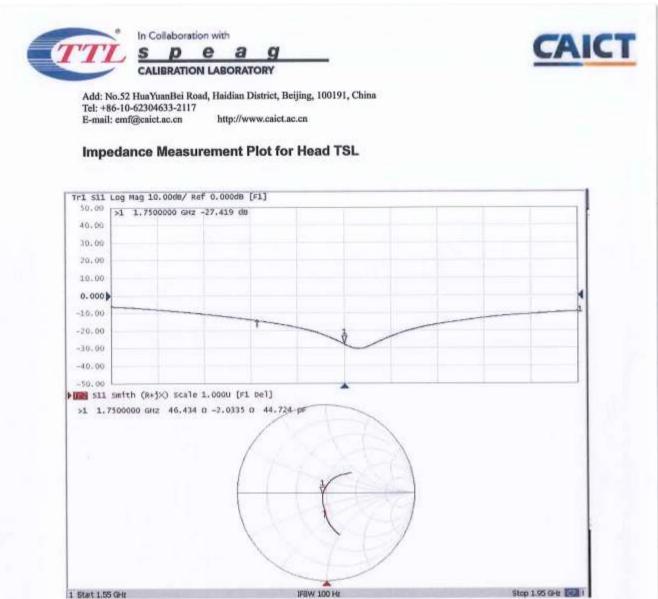
Reference Value = 97.48 V/m; Power Drift = -0.01 dB Peak SAR (extrapolated) = 17.1 W/kg SAR(1 g) = 9.23 W/kg; SAR(10 g) = 4.9 W/kg Smallest distance from peaks to all points 3 dB below = 9.5 mm Ratio of SAR at M2 to SAR at M1 = 54.9% Maximum value of SAR (measured) = 14.3 W/kg



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

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Page 5 of 6



1 Start 1.55 GHz

Certificate No: 24J02Z000008

Page 6 of 6

Tel: +86-10-62304633-2117 E-mail: cttl@chinattl.com	http://www.cai	ST. SPORT	
Client JYT		Certificate No: Z2	2-60211
CALIBRATION CI	ERTIFICAT	Е	
Object	D1900	V2 - SN: 5d175	
Calibration Procedure(s)	EE 244	-003-01	
		tion Procedures for dipole validation kits	
Calibration date:	June 7		
		traceability to national standards, which rea	
pages and are part of the ce	ertificate.		
All calibrations have been humidity<70%. Calibration Equipment used	conducted in t (M&TE critical fr ID # 106277 104291	he closed laboratory facility: environment i or calibration) Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-Jan-22(SPEAG,No.EX3-7464_Jan22) 12-Jan-22(CTTL-SPEAG,No.Z22-60007)	temperature (22±3)°C and Scheduled Calibration Sep-22 Sep-22 Jan-23 Jan-23
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4	conducted in t (M&TE critical fo ID # 106277 104291 SN 7464	Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-Jan-22(SPEAG,No.EX3-7464_Jan22) 12-Jan-22(CTTL-SPEAG,No.Z22-60007)	Scheduled Calibration Sep-22 Sep-22 Jan-23
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4	conducted in t (M&TE critical fr 106277 104291 SN 7464 SN 1556 ID # MY49071430	Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-Jan-22(SPEAG,No.EX3-7464_Jan22)	Scheduled Calibration Sep-22 Sep-22 Jan-23 Jan-23
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C	conducted in t (M&TE critical fr 106277 104291 SN 7464 SN 1556 ID # MY49071430	Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-Jan-22(SPEAG,No.EX3-7464_Jan22) 12-Jan-22(CTTL-SPEAG,No.Z22-60007) Cal Date (Calibrated by, Certificate No.) 13-Jan-22 (CTTL, No.J22X00409)	Scheduled Calibration Sep-22 Sep-22 Jan-23 Jan-23 Scheduled Calibration Jan-23
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C Network Analyzer E5071C	conducted in t (M&TE critical fr 106277 104291 SN 7464 SN 1556 ID # MY49071430 MY46110673	Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-Jan-22(SPEAG,No.EX3-7464_Jan22) 12-Jan-22(CTTL-SPEAG,No.Z22-60007) Cal Date (Calibrated by, Certificate No.) 13-Jan-22 (CTTL, No.J22X00409) 14-Jan-22 (CTTL, No.J22X00406)	Scheduled Calibration Sep-22 Sep-22 Jan-23 Jan-23 Scheduled Calibration Jan-23 Jan-23
humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C	conducted in t (M&TE critical fe 106277 104291 SN 7464 SN 1556 ID # MY49071430 MY46110673 Name	Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-Jan-22(SPEAG,No.EX3-7464_Jan22) 12-Jan-22(CTTL-SPEAG,No.Z22-60007) Cal Date (Calibrated by, Certificate No.) 13-Jan-22 (CTTL, No.J22X00409) 14-Jan-22 (CTTL, No.J22X00406) Function	Scheduled Calibration Sep-22 Sep-22 Jan-23 Jan-23 Scheduled Calibration Jan-23 Jan-23

Certificate No: Z22-60211

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) 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%.

Page 2 of 6



In Collaboration with S P e a g CALIBRATION LABORATORY

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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	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	39.9 ± 6 %	1.39 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	9.93 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	39.9 W/kg ± 18.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.18 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	20.8 W/kg ± 18.7 % (k=2)

Page 3 of 6





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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.7Ω+ 6.90jΩ	
Return Loss	- 24.4dB	

General Antenna Parameters and Design

Electrical Delay (one direction)	1.110 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

Manufactured by	SPEAG	
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Page 4 of 6





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DASY5 Validation Report for Head TSL Test Laboratory: CTTL, Beijing, China DUT: Dipole 1900 MHz; Type: D1900V2; Serial:

Date: 2022-06-07

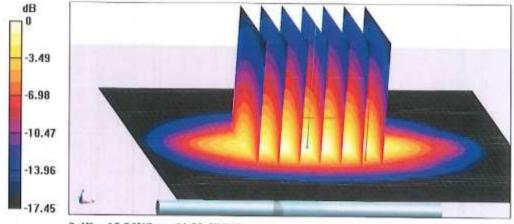
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d175 Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1 Medium parameters used: f = 1900 MHz; σ = 1.385 S/m; ε_r = 39.85; p = 1000 kg/m³ Phantom section: Right Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 SN7464; ConvF(8.18, 8.18, 8.18) @ 1900 MHz; Calibrated: 2022-01-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2022-01-12
- 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 = 101.8 V/m; Power Drift = 0.00 dB Peak SAR (extrapolated) = 18.5 W/kg SAR(1 g) = 9.93 W/kg; SAR(10 g) = 5.18 W/kg Smallest distance from peaks to all points 3 dB below = 10 mm Ratio of SAR at M2 to SAR at M1 = 54.3% Maximum value of SAR (measured) = 15.5 W/kg



0 dB = 15.5 W/kg = 11.90 dBW/kg

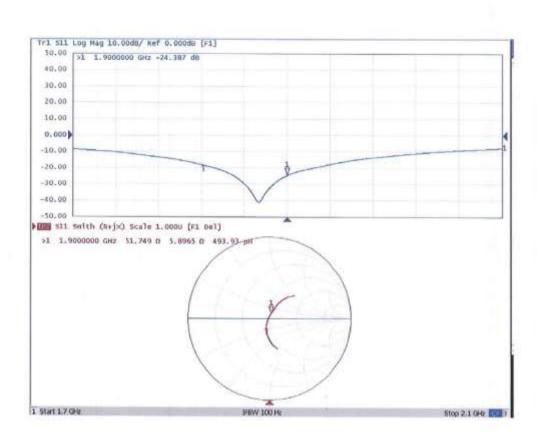
Certificate No: Z22-60211

Page 5 of 6





Impedance Measurement Plot for Head TSL



Certificate No: Z22-60211

Page 6 of 6

Dipole Impedance and Return Loss Check Report

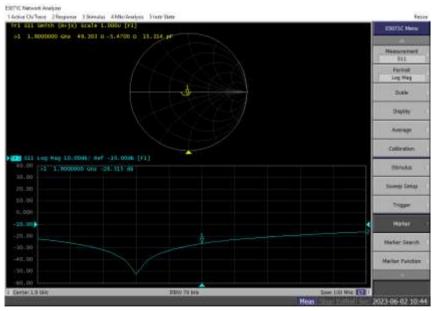
Object:	D1900V2 - SN: 5d175
Check Date:	June 02, 2023
Check reference:	IEC/IEEE 62209-1528:2020, FCC KDB 865664 D01
Checked By:	Janet Wei (Janet Wei, SAR project engineer)
Reviewed By:	Winner Zhang, Technical manager)

Environment of Test Site

Temperature:	21 ~ 23°C
Humidity:	50~60% RH
Atmospheric Pressure:	1011 mbar

Test Data

Measurement Plot for Head TSL In 2023



Comparison with Original report

Items	Checked By JYT In 2022	Checked By JYT In 2023	Deviation	Limit
Impendence for Head TSL	48.61Ω -6.42jΩ	49.30Ω-5.47jΩ	0.69Ω+0.95jΩ	±5Ω
Return Loss for Head TSL	-23.53	-26.32	11.86%	±20%(No less than 20 dB)

Result

Compliance

Add: No.52 HunYuanBei Roa	N LABORATORY		IBRATION AS L0570
Tel: +86-10-62304633-2117 E-mail: cttl@chinutl.com	http://www.caie	rt.nc.en	
Client JYT			2-60212
CALIBRATION CE	RTIFICAT	E	
Object	D2450V	/2 - SN: 910	1111
Calibration Procedure(s)			
Calibration Procedure(a)	FF-Z11-	the second se	
	Calibrat	ion Procedures for dipole validation kits	
Calibration date:	June 6,	2022	
pages and are part of the ce All calibrations have been humidity<70%.		he closed laboratory facility: environment	temperature (22±3)°C and
All calibrations have been humidity<70%. Calibration Equipment used	conducted in th (M&TE critical for	or calibration)	
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards	conducted in the (M&TE critical for ID#	or calibration) Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2	conducted in ti (M&TE critical fo ID # 106277	Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326)	Scheduled Calibration Sep-22
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S	Conducted in the conducted in the conducted in the conducted for t	Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326)	Scheduled Calibration Sep-22 Sep-22
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2	conducted in ti (M&TE critical fo ID # 106277	Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326)	Scheduled Calibration Sep-22
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4	conducted in ti (M&TE critical fo ID # 106277 104291 SN 7464 SN 1556	Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-Jan-22(SPEAG,No.EX3-7464_Jan22) 12-Jan-22(CTTL-SPEAG,No.Z22-60007)	Scheduled Calibration Sep-22 Sep-22 Jan-23 Jan-23
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards	conducted in ti (M&TE critical fo ID # 106277 104291 SN 7464 SN 1556 ID #	Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-Jan-22(SPEAG,No.EX3-7464_Jan22) 12-Jan-22(CTTL-SPEAG,No.Z22-60007) Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration Sep-22 Sep-22 Jan-23 Jan-23 Scheduled Calibration
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4	conducted in ti (M&TE critical fo ID # 106277 104291 SN 7464 SN 1556	Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-Jan-22(SPEAG,No.EX3-7464_Jan22) 12-Jan-22(CTTL-SPEAG,No.Z22-60007)	Scheduled Calibration Sep-22 Sep-22 Jan-23 Jan-23
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C	conducted in ti (M&TE critical fo ID # 106277 104291 SN 7464 SN 1556 ID # MY49071430	Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-Jan-22(SPEAG,No.EX3-7464_Jan22) 12-Jan-22(CTTL-SPEAG,No.Z22-60007) Cal Date (Calibrated by, Certificate No.) 13-Jan-22 (CTTL, No. J22X00409)	Scheduled Calibration Sep-22 Sep-22 Jan-23 Jan-23 Scheduled Calibration Jan-23
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C	conducted in ti (M&TE critical fo ID # 106277 104291 SN 7464 SN 1556 ID # MY49071430 MY46110673	Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-Jan-22(SPEAG,No.EX3-7464_Jan22) 12-Jan-22(CTTL-SPEAG,No.Z22-60007) Cal Date (Calibrated by, Certificate No.) 13-Jan-22 (CTTL, No. J22X00409) 14-Jan-22 (CTTL, No.J22X00406)	Scheduled Calibration Sep-22 Jan-23 Jan-23 Scheduled Calibration Jan-23 Jan-23
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C Network Analyzer E5071C	conducted in ti (M&TE critical fo ID # 106277 104291 SN 7464 SN 1556 ID # MY49071430 MY46110673 Name	Cal Date (Calibrated by, Certificate No.) 24-Sep-21 (CTTL, No.J21X08326) 24-Sep-21 (CTTL, No.J21X08326) 26-Jan-22(SPEAG,No.EX3-7464_Jan22) 12-Jan-22(CTTL-SPEAG,No.Z22-60007) Cal Date (Calibrated by, Certificate No.) 13-Jan-22 (CTTL, No.J22X00409) 14-Jan-22 (CTTL, No.J22X00406) Function	Scheduled Calibration Sep-22 Jan-23 Jan-23 Scheduled Calibration Jan-23 Jan-23

Certificate No: Z22-60212





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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:

01-----

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%.

Certificate No: Z22-60212

Page 2 of 6





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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	40.0 ± 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	13.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	53.4 W/kg ± 18.8 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.19 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.8 W/kg ± 18.7 % (k=2)

Certificate No: Z22-60212

Page 3 of 6





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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.2Ω+ 2.79jΩ	
Return Loss	- 27.7dB	

General Antenna Parameters and Design

Electrical Delay (one direction)	1.066 ns
	1 SOT 850 C + 92

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feed-point may be damaged.

Additional EUT Data

Manufactured by	SPEAG

Page 4 of 6



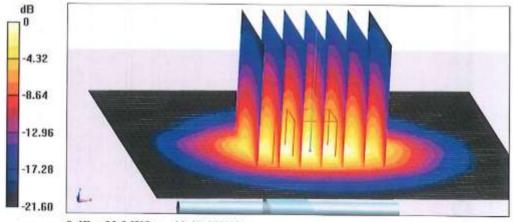


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- Probe: EX3DV4 SN7464; ConvF(7.77, 7.77, 7.77) @ 2450 MHz; Calibrated: 2022-01-26
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2022-01-12
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; 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 = 97.85 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 27.3 W/kg SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.19 W/kg Smallest distance from peaks to all points 3 dB below = 8.5 mm Ratio of SAR at M2 to SAR at M1 = 49.3% Maximum value of SAR (measured) = 22.3 W/kg



0 dB = 22.3 W/kg = 13.48 dBW/kg

Certificate No: Z22-60212

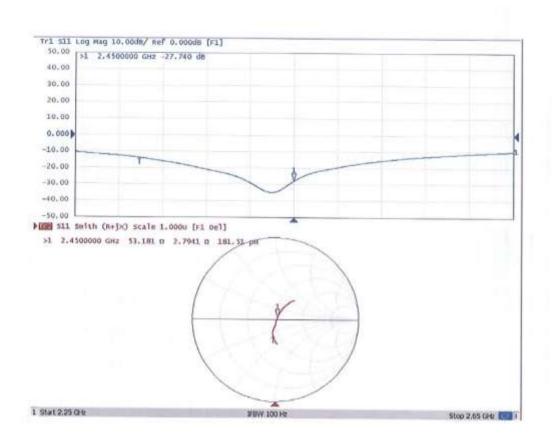
Page 5 of 6





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Impedance Measurement Plot for Head TSL



Certificate No: Z22-60212

Page 6 of 6

Dipole Impedance and Return Loss Check Report

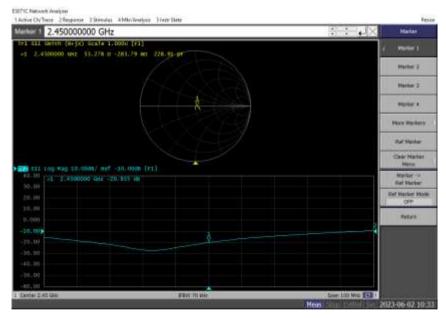
Object:	D2450V2 - SN: 910		
Check Date:	June 02, 2023		
Check reference:	IEC/IEEE 62209-1528:2020, FCC KDB 865664 D01		
Checked By:	Janet Wei (Janet Wei, SAR project engineer)		
Reviewed By:	Winner Zhang, Technical manager)		

Environment of Test Site

Temperature:	18 ~ 25°C
Humidity:	50~60% RH
Atmospheric Pressure:	1011 mbar

Test Data

Measurement Plot for Head TSL In 2023



Comparison with Original report

Items	Checked By JYT In 2022	Checked By JYT In 2023	Deviation	Limit
Impendence for Head TSL	51.33Ω-2.73jΩ	53.28Ω-0.28jΩ	1.95Ω+2.45jΩ	±5Ω
Return Loss for Head TSL	-23.76dB	-20.94dB	-11.87%	±20%(No less than 20 dB)

Result

Compliance

Calibration information for DAE

	Г	Certifica	te No: 23J02Z80167
CALIBRATION	CERTIFICA	ΓE	
Object	DAE4	- SN: 1373	
Calibration Procedure(s)	FF-Z1	1-002-01 ation Procedure for the Data Acq	uisition Electronics
Calibration date:	Noven	nber 27, 2023	
Calibration Equipment us Primary Standards Process Calibrator 753		for calibration) al Date(Calibrated by, Certificate No. 12-Jun-23 (CTTL, No.J23X05436)) Scheduled Calibration Jun-24
Primary Standards	ID# Ca	al Date(Calibrated by, Certificate No.)	
Primary Standards Process Calibrator 753	ID # Ca 1971018 Name	al Date(Calibrated by, Certificate No. 12-Jun-23 (CTTL, No.J23X05436) Function	
Primary Standards Process Calibrator 753	ID # Ca 1971018	al Date(Calibrated by, Certificate No. 12-Jun-23 (CTTL, No.J23X05436)	Jun-24
Primary Standards Process Calibrator 753 Calibrated by:	ID # Ca 1971018 Name	al Date(Calibrated by, Certificate No. 12-Jun-23 (CTTL, No.J23X05436) Function	Jun-24
Primary Standards	ID # Ca 1971018 Name Yu Zongying	al Date(Calibrated by, Certificate No. 12-Jun-23 (CTTL, No.J23X05436) Function SAR Test Engineer	Jun-24







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Glossary:

DAE Connector angle data acquisition electronics information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters:

- DC Voltage Measurement: Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- Connector angle: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The report provide only calibration results for DAE, it does not contain other performance test results.

Page 2 of 3





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DC Voltage Measurement

A/D - Converter Re High Range:	1LSB =	6.1µV.	full range =	-100+300 mV
Low Range:	1LSB =	61nV .	full range =	-1+3mV
DASY measuremen	t parameters:	Auto Zero T	ime: 3 sec; Meas	uring time: 3 sec

Calibration Factors	x	Y	z
High Range	403.923 ± 0.15% (k=2)	403.888 ± 0.15% (k=2)	404.180 ± 0.15% (k=2)
Low Range	3.98648 ± 0.7% (k=2)	4.00763±0.7% (k=2)	4.01077 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	346.5° ± 1 °
Connector Angle to be used in DAST system	340.0 T I

Certificate No: 23J02Z80167

Page 3 of 3

-----End of Report-----