Date: 12/2/2022

Wifi 2.4G-M-Body

Communication System: UID 0, Generic WIFI (0); Frequency: 2437 MHz; Duty Cycle: 1:1 Medium parameters used (interpolated): f = 2437 MHz; $\sigma = 1.802$ S/m; $\varepsilon_r = 39.42$; $\rho = 1000$ kg/m³ Phantom section: Flat Section

Ambient Temperature:22.4°C;Liquid Temperature:22.2°C;

DASY Configuration:

- Probe: EX3DV4 SN7494; ConvF(7.9, 7.9, 7.9) @ 2437 MHz; Calibrated: 5/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/12/2022
- Phantom: Twin-SAM V8.0; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Rear/CH 6/Area Scan (71x151x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm Maximum value of SAR (interpolated) = 0.331 W/kg

Rear/CH 6/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 3.245 V/m; Power Drift = -0.11 dB Peak SAR (extrapolated) = 0.429 W/kgSAR(1 g) = 0.221 W/kg; SAR(10 g) = 0.108 W/kgMaximum value of SAR (measured) = 0.352 W/kg



Wifi 5G U-NII-1-L-Body

Communication System: UID 0, Generic WIFI (0); Frequency: 5180 MHz;Duty Cycle: 1:1 Medium parameters used: f = 5180 MHz; $\sigma = 4.746$ S/m; $\varepsilon_r = 36.15$; $\rho = 1000$ kg/m³ Phantom section: Flat Section Ambient Temperature:22.4°C;Liquid Temperature:22.2°C;

DASY Configuration:

- Probe: EX3DV4 SN7494; ConvF(5.61, 5.61, 5.61) @ 5180 MHz; Calibrated: 5/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/12/2022
- Phantom: Twin-SAM V8.0; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Rear/CH36/Area Scan (91x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm Maximum value of SAR (interpolated) = 0.880 W/kg

Rear/CH36/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 2.288 V/m; Power Drift = -0.12 dB Peak SAR (extrapolated) = 1.37 W/kg SAR(1 g) = 0.437 W/kg; SAR(10 g) = 0.173 W/kg. Maximum value of SAR (measured) = 0.913 W/kg



0 dB = 0.913 W/kg = -0.40 dBW/kg

Wifi 5G U-NII-2A-H-Body

Communication System: UID 0, Generic WIFI (0); Frequency: 5320 MHz;Duty Cycle: 1:1 Medium parameters used: f = 5320 MHz; $\sigma = 4.881$ S/m; $\varepsilon_r = 36.056$; $\rho = 1000$ kg/m³ Phantom section: Flat Section Ambient Temperature:22.3°C;Liquid Temperature:22.0°C;

DASY Configuration:

- Probe: EX3DV4 SN7494; ConvF(5.61, 5.61, 5.61) @ 5320 MHz; Calibrated: 5/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/12/2022
- Phantom: Twin-SAM V8.0 ; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Rear/CH64/Area Scan (91x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm Maximum value of SAR (interpolated) = 0.948 W/kg

Rear/CH64/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 2.342 V/m; Power Drift = -0.06 dB Peak SAR (extrapolated) = 1.48 W/kg SAR(1 g) = 0.442 W/kg; SAR(10 g) = 0.186 W/kg Maximum value of SAR (measured) = 0.983 W/kg



0 dB = 0.983 W/kg = -0.07 dBW/kg

Wifi 5G U-NII-2C-H-Body

Communication System: UID 0, Generic WIFI (0); Frequency: 5720 MHz;Duty Cycle: 1:1 Medium parameters used: f = 5720 MHz; $\sigma = 5.258$ S/m; $\varepsilon_r = 35.758$; $\rho = 1000$ kg/m³ Phantom section: Flat Section Ambient Temperature:22.2°C;Liquid Temperature:22.0°C;

DASY Configuration:

- Probe: EX3DV4 SN7494; ConvF(4.97, 4.97, 4.97) @ 5720 MHz; Calibrated: 5/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/12/2022
- Phantom: Twin-SAM V8.0; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Rear/CH144/Area Scan (91x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm Maximum value of SAR (interpolated) = 1.06 W/kg

Rear/CH144/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 1.852 V/m; Power Drift = -0.04 dB Peak SAR (extrapolated) = 1.61 W/kg SAR(1 g) = 0.457 W/kg; SAR(10 g) = 0.173 W/kg Maximum value of SAR (measured) = 1.03 W/kg



0 dB = 1.03 W/kg = 0.13 dBW/kg

Date: 12/6/2022

Wifi 5G U-NII-3-M-Body

Communication System: UID 0, Generic WIFI (0); Frequency: 5785 MHz; Duty Cycle: 1:1 Medium parameters used (interpolated): f = 5785 MHz; $\sigma = 5.328$ S/m; $\varepsilon_r = 35.779$; $\rho = 1000$ kg/m³ Phantom section: Flat Section Ambient Temperature:22.5°C;Liquid Temperature:22.3°C;

DASY Configuration:

- Probe: EX3DV4 SN7494; ConvF(4.97, 4.97, 4.97) @ 5785 MHz; Calibrated: 5/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/12/2022
- Phantom: Twin-SAM V8.0; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Rear/CH157/Area Scan (91x181x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm Maximum value of SAR (interpolated) = 1.10 W/kg

Rear/CH157/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 1.872 V/m; Power Drift = -0.10 dB Peak SAR (extrapolated) = 1.67 W/kgSAR(1 g) = 0.473 W/kg; SAR(10 g) = 0.179 W/kgMaximum value of SAR (measured) = 1.07 W/kg



0 dB = 1.07 W/kg = 0.29 dBW/kg

Date: 12/2/2022

Bluetooth-L-Body

Communication System: UID 0, Generic BT (0); Frequency: 2402 MHz;Duty Cycle: 1:1 Medium parameters used (interpolated): f = 2402 MHz; $\sigma = 1.763$ S/m; $\varepsilon_r = 39.41$; $\rho = 1000$ kg/m³ Phantom section: Flat Section

Ambient Temperature:22.2°C;Liquid Temperature:22.0°C;

DASY Configuration:

- Probe: EX3DV4 SN7494; ConvF(7.9, 7.9, 7.9) @ 2402 MHz; Calibrated: 5/16/2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1549; Calibrated: 4/12/2022
- Phantom: Twin-SAM V8.0; Type: QD 000 P41 AA; Serial: 1974
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

Rear/CH0/Area Scan (71x151x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm Maximum value of SAR (interpolated) = 0.0446 W/kg

Rear/CH0/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 2.070 V/m; Power Drift = -0.11 dB Peak SAR (extrapolated) = 0.0560 W/kg SAR(1 g) = 0.029 W/kg; SAR(10 g) = 0.015 W/kg. Maximum value of SAR (measured) = 0.0454 W/kg



0 dB = 0.0454 W/kg = -13.43 dBW/kg

1.1.1. DAE4 Calibration Certificate

Add: No.52 HuaYuanBei Road Tel: +86-10-62304633-2512	I, Haidian District, Beijin Fax: +86-10-623046.	ig, 100191, China 33-2504	CALIBRATION CNAS L0570
E-mail: cttl@chinattLcom	Http://www.chinattl.	cn Certificate	No: Z22-60121
CALIBRATION	CERTIFICAT	E	
Object	DAE4 -	SN: 1549	
	1	12 11	
Calibration Procedure(s)	FF-Z11	-002-01	
	Calibra (DAEx)	tion Procedure for the Data Acquis	sition Electronics
Calibration data:	April 12	2, 2022	A DESCRIPTION OF THE OWNER OF THE
This calibration Certifica measurements(SI). The r pages and are part of the All calibrations have be humidity<70%. Calibration Equipment us	te documents the t measurements and e certificate. een conducted in t	traceability to national standards, whi the uncertainties with confidence prob the closed laboratory facility: environ or calibration)	ich realize the physical units c bability are given on the following nment temperature(22±3)℃ and
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Calibrated by: Reviewed by:	te documents the t measurements and e certificate. een conducted in t med (M&TE critical fo ID # Cal 1971018 Name Yu Zongying Lin Hao	raceability to national standards, whi the uncertainties with confidence prob he closed laboratory facility: environ or calibration) Date(Calibrated by, Certificate No.) 15-Jun-21 (CTTL, No.J21X04465) Function SAR Test Engineer SAR Test Engineer	ich realize the physical units of bability are given on the following nment temperature(22±3)℃ and Scheduled Calibration Jun-22 Signature



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.



1.2. Probe Calibration Certificate

Client CALIBRATIC Object Calibration Procedu Calibration date:	HTW ON CE	RTIFICATE EX3DV4 -	Certificate SN : 7494	• No: Z22	2-60102
CALIBRATIC Object Calibration Procedu Calibration date:	ON CE	EX3DV4 -	SN : 7494		
Object Calibration Procedu Calibration date:	ure(s)	EX3DV4 -	SN : 7494		The state of the state of the
Calibration Procedu	ure(s)	-			
Calibration date:		FF-Z11-00 Calibration	4-02		
		May 16, 20	122	robes	
All calibrations hav humidity<70%. Calibration Equipme	re been c nt used (N	Nonducted in the	closed laboratory facility: environ	ment tempe	rature(22±3)℃ and
Primary Standards					
Primary Standards Power Meter NRP	2	101919	Cal Date(Calibrated by, Certificate	No.) Sch	eduled Calibration
Primary Standards Power Meter NRP Power sensor NR	2 P-Z91	101919	Cai Date(Calibrated by, Certificate 15-Jun-21(CTTL, No.J21X04466) 15-Jun-21(CTTL, No.J21X04466)	No.) Sch	eduled Calibration Jun-22
Primary Standards Power Meter NRP Power sensor NR Power sensor NR	2 P-Z91 P-Z91	101919 101547 101548	Cai Date(Calibrated by, Certificate 15-Jun-21(CTTL, No.J21X04466) 15-Jun-21(CTTL, No.J21X04466) 15-Jun-21(CTTL, No.J21X04466)	No.) Sch	aduled Calibration Jun-22 Jun-22
Primary Standards Power Meter NRP Power sensor NR Power sensor NR Reference 10dBA	2 P-Z91 P-Z91 ttenuator	101919 101547 101548 18N50W-10dB	Car Date(Calibrated by, Certificate 15-Jun-21(CTTL, No.J21X04466) 15-Jun-21(CTTL, No.J21X04466) 15-Jun-21(CTTL, No.J21X04466) 20-Jan-21(CTTL, No.J21X00486)	No.) Sch	aduled Calibration Jun-22 Jun-22 Jun-22
Primary Standards Power Meter NRP Power sensor NR Power sensor NR Reference 10dBA Reference 20dBA	P-Z91 P-Z91 P-Z91 ttenuator ttenuator	101919 101547 101548 18N50W-10dB 18N50W-20dB	Car Date(Calibrated by, Certificate 15-Jun-21(CTTL, No.J21X04466) 15-Jun-21(CTTL, No.J21X04466) 15-Jun-21(CTTL, No.J21X04466) 20-Jan-21(CTTL, No.J21X00486) 20-Jan-21(CTTL, No.J21X00485)	No.) Sch	aduled Calibration Jun-22 Jun-22 Jun-22 Jan-23
Primary Standards Power Meter NRP Power sensor NR Power sensor NRI Reference 10dBA Reference 20dBA Reference Probe B	P-Z91 P-Z91 ttenuator ttenuator EX3DV4	101919 101547 101548 18N50W-10dB 18N50W-20dB SN 7464	Cai Date(Calibrated by, Certificate 15-Jun-21(CTTL, No.J21X04466) 15-Jun-21(CTTL, No.J21X04466) 15-Jun-21(CTTL, No.J21X04466) 20-Jan-21(CTTL, No.J21X00486) 20-Jan-21(CTTL, No.J21X00485) 26-Jan-22(SPEAG, No.EX3-7464	No.) Sch	eduled Calibration Jun-22 Jun-22 Jun-22 Jan-23 Jan-23 Jan-23
Primary Standards Power Meter NRP Power sensor NR Power sensor NRI Reference 10dBA Reference 20dBA Reference Probe B DAE4	P-Z91 P-Z91 ttenuator ttenuator EX3DV4	101919 101547 101548 18N50W-10dB 18N50W-20dB SN 7464 SN 1555	Car Date(Calibrated by, Certificate 15-Jun-21(CTTL, No.J21X04466) 15-Jun-21(CTTL, No.J21X04466) 20-Jan-21(CTTL, No.J21X04466) 20-Jan-21(CTTL, No.J21X00486) 20-Jan-21(CTTL, No.J21X00485) 26-Jan-22(SPEAG, No.EX3-7464_ 20-Aug-21(SPEAG, No.DAE4-155)	No.) Sch Jan22) 5_Aug21/2)	eduled Calibration Jun-22 Jun-22 Jun-22 Jan-23 Jan-23 Jan-23 Aug-22
Primary Standards Power Meter NRF Power sensor NR Power sensor NR Reference 10dBA Reference 20dBA Reference Probe B DAE4 Secondary Standard	P-Z91 P-Z91 P-Z91 ttenuator ttenuator EX3DV4	101919 101547 101548 18N50W-10dB 18N50W-20dB SN 7464 SN 1555	Car Date(Calibrated by, Certificate 15-Jun-21(CTTL, No.J21X04466) 15-Jun-21(CTTL, No.J21X04466) 15-Jun-21(CTTL, No.J21X04466) 20-Jan-21(CTTL, No.J21X00486) 20-Jan-21(CTTL, No.J21X00485) 26-Jan-22(SPEAG, No.EX3-7464_ 20-Aug-21(SPEAG, No.DAE4-1559) Cal Date(Calibrated by, Certificate No.1	No.) Schr Jan22) 5_Aug21/2)	Jun-22 Jun-22 Jun-22 Jan-23 Jan-23 Jan-23 Jan-23 Aug-22
Primary Standards Power Meter NRF Power sensor NR Power sensor NR Reference 10dBA Reference 20dBA Reference Probe B DAE4 Secondary Standard SignalGenerator M	P-Z91 P-Z91 P-Z91 ttenuator ttenuator EX3DV4	101919 101547 101548 18N50W-10dB 18N50W-20dB SN 7464 SN 1555 ID # 6201052605	Cal Date(Calibrated by, Certificate 15-Jun-21(CTTL, No.J21X04466) 15-Jun-21(CTTL, No.J21X04466) 15-Jun-21(CTTL, No.J21X04466) 20-Jan-21(CTTL, No.J21X00486) 20-Jan-21(CTTL, No.J21X00485) 26-Jan-22(SPEAG, No.EX3-7464 20-Aug-21(SPEAG, No.DAE4-155) Cal Date(Calibrated by, Certificate No.) 16-Jun-21(CTTL, No.J21X04467)	No.) Sch Jan22) 5_Aug21/2) Sched	eduled Calibration Jun-22 Jun-22 Jun-22 Jan-23 Jan-23 Jan-23 Aug-22 uled Calibration
Primary Standards Power Meter NRP Power sensor NR Power sensor NR Reference 10dBA Reference 20dBA Reference Probe B DAE4 Secondary Standard SignalGenerator M Network Analyzer B	P-Z91 P-Z91 ttenuator ttenuator EX3DV4 Is IG3700A E5071C	101919 101547 101548 18N50W-10dB 18N50W-20dB SN 7464 SN 1555 ID # 6201052605 MY46110673	Cai Date(Calibrated by, Certificate 15-Jun-21(CTTL, No.J21X04466) 15-Jun-21(CTTL, No.J21X04466) 15-Jun-21(CTTL, No.J21X04466) 20-Jan-21(CTTL, No.J21X00486) 20-Jan-21(CTTL, No.J21X00485) 26-Jan-22(SPEAG, No.EX3-7464_ 20-Aug-21(SPEAG, No.DAE4-1555) Cal Date(Calibrated by, Certificate No.) 16-Jun-21(CTTL, No.J21X04467) 14-Jan-22(CTTL, No.J22X00406)	No.) Sch Jan22) 5_Aug21/2) Sched	aduled Calibration Jun-22 Jun-22 Jan-23 Jan-23 Jan-23 Aug-22 uled Calibration Jun-22 Jan-23
Primary Standards Power Meter NRF Power sensor NR Power sensor NRI Reference 10dBA Reference 20dBA Reference Probe E DAE4 Secondary Standard SignalGenerator M Network Analyzer E	P-Z91 P-Z91 ttenuator ttenuator EX3DV4 Is IG3700A E5071C Nar	101919 101547 101548 18N50W-10dB 18N50W-20dB SN 7464 SN 1555 ID # 6201052605 MY46110673 ne	Cal Date(Calibrated by, Certificate 15-Jun-21(CTTL, No.J21X04466) 15-Jun-21(CTTL, No.J21X04466) 15-Jun-21(CTTL, No.J21X04466) 20-Jan-21(CTTL, No.J21X00486) 20-Jan-21(CTTL, No.J21X00485) 26-Jan-22(SPEAG, No.EX3-7464_ 20-Aug-21(SPEAG, No.DAE4-1559) Cal Date(Calibrated by, Certificate No.) 16-Jun-21(CTTL, No.J21X04467) 14-Jan-22(CTTL, No.J22X00406) Function	No.) Sch Jan22) 5_Aug21/2) Sched	aduled Calibration Jun-22 Jun-22 Jun-22 Jan-23 Jan-23 Jan-23 Aug-22 uled Calibration Jun-22 Jan-23 hature
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Primary Standards Power Meter NRF Power sensor NR Power sensor NR Reference 10dBA Reference 20dBA Reference Probe B DAE4 Secondary Standard SignalGenerator M Network Analyzer B alibrated by:	P-Z91 P-Z91 ttenuator ttenuator EX3DV4 IS IG3700A E5071C Nar Yu Lin	101919 101547 101548 18N50W-10dB 18N50W-20dB SN 7464 SN 1555 ID # 6201052605 MY46110673 ne Zongying Hào	Cal Date(Calibrated by, Certificate 15-Jun-21(CTTL, No.J21X04466) 15-Jun-21(CTTL, No.J21X04466) 15-Jun-21(CTTL, No.J21X04466) 20-Jan-21(CTTL, No.J21X00485) 20-Jan-21(CTTL, No.J21X00485) 26-Jan-22(SPEAG, No.EX3-7464 20-Aug-21(SPEAG, No.DAE4-155) Cal Date(Calibrated by, Certificate No.) 16-Jun-21(CTTL, No.J21X04467) 14-Jan-22(CTTL, No.J22X00406) Function SAR Test Engineer SAR Test Engineer	Jan22) 5_Aug21/2) Sched	eduled Calibration Jun-22 Jun-22 Jan-23 Jan-23 Jan-23 Aug-22 uled Calibration Jun-22 Jan-23 hature

Certificate No: Z22-60102

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11	S	p	e	а	g	C
	CAL	IBRATIC	ON LAB	ORATO	ORY	_
					12039	
Add:	No.52 HuaYi	uanBei R	ond, Hai	idian Di	strict, Beijing, 100191, China	
Add: Tel: +	No.52 HuaYi 86-10-62304	uanBei R	ond, Hai 7	idian Di	istrict, Beijing, 100191, China	

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7494

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm(µV/(V/m) ²) ^A	0.41	0.48	0.42	±10.0%
DCP(mV) ^B	99.2	100.0	100.2	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dBõV	с	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	145.6	±1.9%
		Y	0.0	0.0	1.0		160.4	1
		Z	0.0	0.0	1.0		149.0	1

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).

⁸ 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.

Certificate No:Z22-60102

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CAIC



Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-62304633-2117 E-mail: cttl@chinattl.com http://www.caict.ac.cn

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7494

f [MHz] ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unct. (k=2)
750	41.9	0.89	10.60	10.60	10.60	0.12	1.43	±12.1%
835	41.5	0.90	10.30	10.30	10.30	0.12	1.48	+12.1%
1750	40.1	1.37	8.81	8.81	8.81	0.25	0.92	+12.1%
1900	40.0	1.40	8.45	8.45	8.45	0.25	1.04	+12.1%
2000	40.0	1.40	8.42	8.42	8.42	0.26	1.04	+12.1%
2300	39.5	1.67	8.25	8.25	8.25	0.62	0.63	+12.1%
2450	39.2	1.80	7.90	7.90	7.90	0.41	0.84	+12.1%
2600	39.0	1.96	7.65	7.65	7.65	0.49	0.74	+12 1%
5250	35.9	4.71	5.61	5.61	5.61	0.50	1.20	+13.3%
5600	35.5	5.07	5.01	5.01	5.01	0.45	1.38	+13 3%
5750	35.4	5.22	4.97	4.97	4.97	0.50	1.30	+13.3%

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 below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ±5%. 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.

Certificate No:Z22-60102

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CAICT



Certificate No.Z22-60102

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CAICT



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DASY/EASY - Parameters of Probe: EX3DV4 - SN:7494

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	22.4
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:722-60102

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1.1. D750V3 Dipole Calibration Certificate

Tal: +86-10-62304635-2	U/9 T 8A. 900	10 une e corre	
E-mail: cttl@chinattl.com	m http://www	Certificate No: Z21-6	30016
Client HIW	TIEICATE		
ALIBRATION CER	TIFICATE		
	07501/2	CN: 1180	
bject	D750V3 -	5N. 1160	
alibration Procedure(s)	FE 711.0	03-01	
alpration r toocacie (-)	Calibratio	on Procedures for dipole validation kits	
	Culture		1250
alibration date:	January 2	22, 2021	
		he closed laboratory facility: environment	temperature(22±3)°C an
All calibrations have been on humidity<70%. Calibration Equipment used (conducted in th M&TE critical fo	he closed laboratory facility: environment to	temperature(22±3)℃ an
All calibrations have been on humidity<70%. Calibration Equipment used (conducted in th	he closed laboratory facility: environment to or calibration)	temperature(22±3)°C an Schieduled Calibration
All calibrations have been on numidity<70%. Calibration Equipment used (Primary Standards	M&TE critical fo	he closed laboratory facility: environment to or calibration) Cal Date(Calibrated by, Certificate No.) 12-May-20 (CTTL, No.J20X02965)	Schieduled Calibration May-21
All calibrations have been on humidity<70%. Calibration Equipment used (Primary Standards Power Meter NRP2	Conducted in the M&TE critical for 10 # 106276 101369	he closed laboratory facility: environment for calibration) Cal Date(Calibrated by, Certificate No.) 12-May-20 (CTTL, No.J20X02965) 12-May-20 (CTTL, No.J20X02965)	temperature(22±3)℃ an Scheduled Calibration May-21 May-21 Nay-21
All calibrations have been on humidity<70%. Calibration Equipment used (Primary Standards Power Meter NRP2 Power sensor NRP6A PoferenceProbe EX3DV4	Conducted in the M&TE critical for ID # 106276 101369 SN 7600	he closed laboratory facility: environment f or 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)	temperature(22±3)℃ an Scheduled Calibration May-21 May-21 Nov-21 Feb-21
All calibrations have been on humidity<70%. Calibration Equipment used (Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4	Conducted in the M&TE critical for ID # 106276 101369 SN 7600 SN 771	he closed laboratory facility: environment f or 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)	temperature(22±3)℃ an Scheduled Calibration May-21 May-21 Nov-21 Feb-21
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All calibrations have been on humidity<70%. Calibration Equipment used (Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C	Conducted in the M&TE critical for ID # 106276 101369 SN 7600 SN 771 ID # MY49071430 MY4910673	he closed laboratory facility: environment f or 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)	temperature(22±3)℃ an Scheduled Calibration May-21 May-21 Nov-21 Feb-21 Scheduled Calibratio Feb-21 Feb-21
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All calibrations have been on humidity<70%. Calibration Equipment used (Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C	conducted in th M&TE critical fo ID # 106276 101369 SN 7600 SN 771 ID # MY49071430 MY46110673 Name	he closed laboratory facility: environment f or 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	temperature(22±3)℃ an Scheduled Calibration May-21 May-21 Nov-21 Feb-21 Scheduled Calibratio Feb-21 Feb-21 Signature
All calibrations have been on humidity<70%. Calibration Equipment used (Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C	Conducted in the M&TE critical for ID # 106276 101369 SN 7600 SN 771 ID # MY49071430 MY46110673 Name Zhao Jing	he closed laboratory facility: environment f or 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 SAR Test Engineer	temperature(22±3)℃ an Scheduled Calibration May-21 Nov-21 Feb-21 Scheduled Calibratio Feb-21 Feb-21 Signature
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Glossary:

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

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- 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

ASY 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	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	2.555	

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

Manufactured by	14		SPEAG	
	1000 miles 1000 miles			
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ificate No: Z21-60016		Page 4 of 6		
	14 A			



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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





Extended Dipole Calibrations

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	Doturn loss (dP)		Real Impedance	Delta	Imaginary	Delta
measurement	Return-ioss (ub)	Della (%)	(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

The return loss is <-20dB, within 20% of prior calibration; the impedance is within 50hm of prior calibration. Therefore the verification result should support extended calibration.

1.2. D835V2 Dipole Calibration Certificate

Add: No.51 Xuevu	an Road, Haidian Di	strict. Beijing, 100191. China	GNAS 校准 CALIBRATION
Tel: +86-10-62304	633-2079 Fax:	+86-10-62304633-2504	CNAS L0570
Client HTW	ancon napo	Certificate No:	Z21-60017
CALIDDATION	EDTICIOAT	re la	THE REAL PROPERTY OF
CALIBRATION C	ERTIFICA	16	in the second
Object	D835V	/2 - SN: 4d238	
Calibration Procedure(s)			and and a second se
	FF-Z11	1-003-01	State of the second
	Galibre	ation Procedures for apple validation kits	
Calibration date:	Januar	ry 22, 2021	
All calibrations have been	conducted in	the closed laboratory facility: environm	ent temperature/22+31% and
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4	n conducted in d (M&TE critical f ID # 106276 101369 SN 7600 SN 771	the closed laboratory facility: environm 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.Z20-60017) Scheduled Calibration May-21 May-21 1) Nov-21 7) Feb-21
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 Secondary Standards	ID # 106276 101369 SN 7600 SN 771 ID #	the closed laboratory facility: environm 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.Z20-6042 10-Feb-20(CTTL-SPEAG,No.Z20-60017 Cal Date(Calibrated by, Certificate No.)	ent temperature(22±3)°C and) Scheduled Calibration May-21 May-21 1) Nov-21 7) Feb-21 Scheduled Calibration
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		In Collaboration with			
	TTL	spea	a g		
	-	CALIBRATION LABOR	ATORY		
Add: No.5	I Xueyuan Road, I	laidian District, Beijing, 10)0191, China		
Tel: +86-10	0-62304633-2079	Fax: +86-10-6230463	3-2504		
E-mail: ctt	@chinattl.com	http://www.chinattl.cr	1		
Classer					
Glossary.	tiecuo	simulating liquid			
ConvF	sensiti	vity in TSL / NORM	Ax v z		1.1
N/A	not app	licable or not meas	sured		
Calibration is	Performed	According to the	Following Sta	indards:	
a) IEEE Std 15	528-2013, "IE	EE Recommende	d Practice for I	Determining the	Peak
Spatial-Aver	aged Specifi	c Absorption Rate	(SAR) in the H	uman Head from	m Wireless
Communica	tions Devices	s: Measurement Te	chniques", Jui	ne 2013	
b) IEC 62209-	1, "Measuren	nent procedure for	assessment o	f specific absorp	otion rate of humar
exposure to	radio freque	ncy fields from har	nd-held and bo	dy-mounted win	eless
communicat	lion devices-	Part 1: Device use	ed next to the e	ar (Frequency r	ange of 300MHz to
) IEC 62209-	2010 Procedure	to measure the S	necific Absorn	tion Rate (SAR)	For wireless
communicat	tion devices i	used in close proxi	mity to the hur	nan body (frequ	ency range of
30MHz to 6	GHz)", March	2010	inty to the num	nun bouy (nequ	oney runge of
d) KDB865664	, SAR Meas	urement Requirem	ents for 100 M	Hz to 6 GHz	
Additional Do	cumentation ystem Handb	n: ook			
		1000 ALC: 1000			
Methods App	lied and Inte	rpretation of Para	ameters:		
Measurem	ent Condition	is: Further details	are available fi	om the Validatio	on Report at the en
of the certi	ficate. All figu	ires stated in the c	ertificate are v	alid at the freque	ency indicated.
point exact	thy below the	center marking of	the flat phanto	m section with	the arms oriented
parallel to	the body axis	Senter marking OF	the nat phanto	in section, with	and annis oriented
Feed Point	t Impedance	and Return Loss: "	These paramet	ters are measur	ed with the dipole
positioned	under the liq	uid filled phantom.	The impedance	e stated is trans	sformed from the
measurem	ent at the SM	A connector to the	e feed point. Th	ne Return Loss	ensures low
reflected p	ower. No unc	ertainty required.			
Electrical D	Jelay: One-w	ay delay between	the SMA conne	ector and the an	itenna feed point.
No uncerta	inty required				
SAR meas	ured: SAR m	easured at the sta	ted antenna in	put power.	Al at the sector
SAR norma	alized: SAK a	is measured, norm	alized to an in	put power of 1 V	v at the antenna
SAR for no	minal TSL n	arameters: The me	asured TSL na	arameters are un	sed to calculate the
nominal SA	AR result.				
The reserve	d upgedeled	he of monormum	at la stated -	a the stand-	d una de la de
Measureme	nt multiplied	by the coverage	nt is stated a	is the standard	uncertainty of
Correspond	s to a covera	de probability of a	provimately 0	5%	mai distribution
COMPACTORIA	o a covera	go probability of ap	proximately 9	010+	11 11
Correspond					
Corresponds					

8 li	Collaboration w	ith				
TTL	spe	а	g	_		
	ALIBRATION LA	BORAT	ORY			
Add: No.51 Xueyuan Road, Hai Tel: +86-10-62304633-2079 E-mail: cttl@chinattl.com	dian District, Beijin Fax: +86-10-623 http://www.china	ng, 10019 04633-2 attl.en	91, China 504			
easurement Conditions DASY system configuration, as fr	ar as not given o	n page	1.			
DASY Version		DASY	52			V52.10.4
Extrapolation	Advan	ced Ext	rapolation			
Phantom	Triple	Flat Pha	antom 5.1C			
Distance Dipole Center - TSL		15 mm	n			with Spacer
Zoom Scan Resolution	dx,	dy, dz =	= 5 mm			
Frequency	835	6 MHz ±	1 MHz			
ead TSL parameters The following parameters and ca	culations were a	pplied. Temp	perature	Permitti	vity	Conductivity
Nominal Head TSL paramete	rs	22	0°C	41.5		0.90 mho/m
Measured Head TSL paramet	ers	(22.0 ±	: 0.2) °C	41.3 ±	6 %	0.89 mho/m ± 6 %
Head TSL temperature change	e during test	<1.	0 °C			
R result with Head TSL						
	g) of Head TSL		Cond	tion		
SAR averaged over 1 cm^3 (1			250 mW ir	put power		2.32 W/kg
SAR averaged over 1 cm ³ (1 SAR measured				WL of be	9.39	W/kg ± 18.8 % (k=2)
SAR averaged over 1 cm ³ (1 SAR measured SAR for nominal Head TSL par	ameters		normalize			
SAR averaged over 1 cm ³ (1 SAR measured SAR for nominal Head TSL par SAR averaged over 10 cm ³ (1	ameters 10 g) of Head TS	L	normalize Condi	tion		
SAR averaged over 1 cm³ (1) SAR measured SAR for nominal Head TSL par SAR averaged over 10 cm³ (1) SAR measured	ameters 10 g) of Head TS	L	normalize Condi 250 mW in	tion put power		1.52 W/kg

Certificate No: Z21-60017

Page 3 of 6

	CALIBRATION LABORATORY		
Add: No.51 Xueyuan Road, Hi Tel: +86-10-62304633-2079 E-mail: cttl@chinattl.com	aidian District, Beijing, 100191, China Fax: +86-10-62304633-2504 http://www.chinattl.cn		
Appendix (Additional ass	essments outside the sco	pe of CNAS L0570)	
Antenna Parameters with	Head TSL		
Impedance, transformed to fe	ed point	51.5Ω- 3.95jΩ	
Return Loss		- 27.6dB	
General Antenna Parame	ters and Design		
Electrical Delay (one direction)	1.298 ns	
After long term use with 100W be measured. The dipole is made of standard onnected to the second arm o of the dipoles, small end caps a ccording to the position as exp ffected by this change. The ov lo excessive force must be ap onnections near the feedpoint	radiated power, only a slight war semirigid coaxial cable. The cer f the dipole. The antenna is there are added to the dipole arms in o blained in the "Measurement Cor verall dipole length is still accordin plied to the dipole arms, because may be damaged.	ming of the dipole near the fe ter conductor of the feeding fore short-circuited for DC-s rder to improve matching wh iditions" paragraph. The SAF ing to the Standard. a they might bend or the sold	eedpoint can line is directly ignals. On son len loaded R data are not lered
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Extended Dipole Calibrations

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	Poturn loss (dP)		Real Impedance	Delta	Imaginary	Delta
measurement	Return-1055 (ub)	Della (%)	(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

The return loss is <-20dB, within 20% of prior calibration; the impedance is within 50hm of prior calibration. Therefore the verification result should support extended calibration.

1.3. D1750V2 Dipole Calibration Certificate

Client HTW		and www.contracti.com	
Onem	ALL SL	Certificate No: Z	21-60018
CALIBRATION C	ERTIFICA	TE	La Barton Martin
Object	D175	0V2 - SN-1164	
	0110	042 - 014, 1104	
Calibration Procedure(s)	FF-Z	11-003-01	A REAL PROPERTY.
	Calib	ration Procedures for dipole validation kits	
Calibration date:	Janua	ary 22, 2021	
This calibration Certificate	documents the	e traceability to national standards, which re	ealize the physical units of
pages and are part of the c	ertificate.	d the uncertainties with confidence probabilit	ty are given on the following
a construction of			
All calibrations have been	n conducted in		
		the closed laboratory facility: environment	nt temperature(22±3)°C and
numidity<70%.		the closed laboratory facility: environment	nt temperature(22±3)°C and
numidity<70%.		the closed laboratory facility: environmer	nt temperature(22±3)°C and
iumidity<70%. Calibration Equipment used	d (M&TE critical	for calibration)	nt temperature(22±3)°C and
umidity<70%. Calibration Equipment used Primary Standards	I (M&TE critical	for calibration) Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
umidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2	ID #	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	ID # 106276 101369	for calibration) Cal Date(Calibrated by, Certificate No.) 12-May-20 (CTTL, No.J20X02965) 12-May-20 (CTTL, No.J20X02965)	Scheduled Calibration May-21 May-21
umidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4	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
umidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4	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)	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	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) 3 10-Feb-20 (CTTL, No.J20X00515) Function	Scheduled Calibration May-21 May-21 Nov-21 Feb-21 Scheduled Calibration Feb-21 Feb-21 Feb-21
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Certificate No: Z21-60018

Page 2 of 6

DASY Version	not given of	DASY52	1		V52.10.4
Extrapolation	Advand	ced Extrapolation			
Phantom	Triple	Flat Phantom 5.1C			
Distance Dipole Center - TSL		10 mm	-		with Spacer
Zoom Scan Resolution	dy	$dy_{1} dz = 5 mm$			Hist opader
Frequency	475	ay, uz = 5 min			
ne following parameters and calculat	tions were a	pplied. Temperature	Permitti	vity	Conductivity
ne following parameters and calculat	tions were a	pplied			
ne following parameters and calculat	tions were a	pplied. Temperature	Permitti	vity	Conductivity
Nominal Head TSL parameters	tions were a	pplied. Temperature 22.0 °C	Permitti 40.1	vity	Conductivity 1.37 mho/m
Nominal Head TSL parameters Measured Head TSL parameters	tions were a	pplied. Temperature 22.0 °C (22.0 ± 0.2) °C	Permitti 40.1 39.8 ± 6	vity 3 %	Conductivity 1.37 mho/m 1.37 mho/m ± 6 %
Nominal Head TSL parameters Measured Head TSL parameters Head TSL temperature change du	tions were a	pplied. Temperature 22.0 °C (22.0 ± 0.2) °C <1.0 °C	Permitti 40.1 39.8 ± 0	vity 3 %	Conductivity 1.37 mho/m 1.37 mho/m ± 6 %
Nominal Head TSL parameters Measured Head TSL parameters Head TSL temperature change du tresult with Head TSL SAR averaged over 1 cm ³ (1 g) of	ring test	pplied. Temperature 22.0 °C (22.0 ± 0.2) °C <1.0 °C Condit	Permitti 40.1 39.8 ± 6	vity 3 %	Conductivity 1.37 mho/m 1.37 mho/m ± 6 %
Nominal Head TSL parameters Measured Head TSL parameters Head TSL temperature change du tresult with Head TSL SAR averaged over 1 cm ³ (1 g) of SAR measured	ring test	pplied. Temperature 22.0 °C (22.0 ± 0.2) °C <1.0 °C Condit 250 mW inj	Permitti 40.1 39.8 ± 6 	3 %	Conductivity 1.37 mho/m 1.37 mho/m ± 6 % 9.13 W/kg
Nominal Head TSL parameters Measured Head TSL parameters Head TSL temperature change du R result with Head TSL SAR averaged over 1 cm ³ (1 g) of SAR measured SAR for nominal Head TSL parameter	ring test	pplied. Temperature 22.0 °C (22.0 ± 0.2) °C <1.0 °C Condit 250 mW in normalize	Permitti 40.1 39.8 ± 6 ion put power d to 1W	vity 3 %	Conductivity 1.37 mho/m 1.37 mho/m ± 6 % 9.13 W/kg W/kg ± 18.8 % (k=2
Nominal Head TSL parameters Measured Head TSL parameters Head TSL temperature change du R result with Head TSL SAR averaged over 1 cm ³ (1 g) of SAR measured SAR for nominal Head TSL paramet SAR averaged over 10 cm ³ (10 g)	tions were a	pplied. Temperature 22.0 °C (22.0 ± 0.2) °C <1.0 °C Condit 250 mW inj normalize Condit	Permitti 40.1 39.8 ± 6 ion put power d to 1W ion	3 % 36.4	Conductivity 1.37 mho/m 1.37 mho/m ± 6 % 9.13 W/kg W/kg ± 18.8 % (k=2)
Nominal Head TSL parameters Measured Head TSL parameters Head TSL temperature change du R result with Head TSL SAR averaged over 1 cm ³ (1 g) of SAR measured SAR for nominal Head TSL paramet SAR averaged over 10 cm ³ (10 g) SAR measured	ring test Head TSL ters of Head TSI	pplied. Temperature 22.0 °C (22.0 ± 0.2) °C <1.0 °C	Permitti 40.1 39.8 ± 0 ion put power d to 1W ion put power	vity 3 % 36.4	Conductivity 1.37 mho/m 1.37 mho/m ± 6 % 9.13 W/kg W/kg ± 18.8 % (k=2 4.80 W/kg

Certificate No: Z21-60018

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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	1
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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	
ficate No: Z21-60018	Page 4 of 6		





Extended Dipole Calibrations

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	Poturn loss (dP)		Real Impedance	Delta	Imaginary	Delta
measurement	Return-1055 (ub)	Della (%)	(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

The return loss is <-20dB, within 20% of prior calibration; the impedance is within 50hm of prior calibration. Therefore the verification result should support extended calibration.

1.4. D1900V2 Dipole Calibration Certificate

Client HTW				4-11117194
and the second sec		-	Certificate No: 221	-00015
ALIBRATION CE	RTIFICATE	E		
bject	D1900V	2 - SN	5d226	
Calibration Procedure(s) FF-Z11-003-01 Calibration Pro		-01 Procedures for dipole validation kits		
Calibration date:	January	22, 20	021	
This calibration Certificate d neasurements(SI). The mea pages and are part of the cert All calibrations have been numidity<70%.	trificate. conducted in t	he clo	osed laboratory facility: environment	temperature(22±3)°C and
This calibration Certificate d neasurements(SI). The mea pages and are part of the cert All calibrations have been numidity<70%. Calibration Equipment used Primary Standards	trificate. conducted in t (M&TE critical for ID # 106276	he clo or calib <u>Cal</u> 12-W	osed laboratory facility: environment oration) Date(Calibrated by, Certificate No.) 1ay-20 (CTTL, No.J20X02965)	temperature(22±3)°C and Scheduled Calibration May-21
This calibration Certificate d neasurements(SI). The mea bages and are part of the cert All calibrations have been numidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4	isurements and t rtificate. conducted in t (M&TE critical for ID # 106276 101369 SN 7600 SN 771	he clo or calib Cal 12-W 12-W 30-N 10-F	osed laboratory facility: environment oration) Date(Calibrated by, Certificate No.) fay-20 (CTTL, No.J20X02965) fay-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 Feb-21
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This calibration Certificate d neasurements(SI). The mea bages and are part of the cert All calibrations have been numidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power Sensor NRP6A ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C	surements and t rtificate. conducted in t (M&TE critical fo ID # 106276 101369 SN 7600 SN 771 ID # MY49071430 MY46110673 Name	he clo br calib 12-W 12-W 30-N 10-F 25-F 10-F	Date(Calibrated by, Certificate No.) May-20 (CTTL, No.J20X02965) May-20 (CTTL, No.J20X02965) May-20 (CTTL-SPEAG,No.Z20-60421) Seb-20 (CTTL-SPEAG,No.Z20-60017) Date(Calibrated by, Certificate No.) Seb-20 (CTTL, No.J20X00516) Seb-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 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

DASY Version	DASY52 V52.10.4	
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm with Spac	
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	40.1 ± 6 %	1.38 mlho/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	9.85 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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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	
ficate No: Z21-60019	Page 4 of 6		





Extended Dipole Calibrations

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	Poturn loss (dR)		Real Impedance	Delta	Imaginary	Delta			
measurement	Return-ioss (ub)	Della (%)	(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			

The return loss is <-20dB, within 20% of prior calibration; the impedance is within 50hm of prior calibration. Therefore the verification result should support extended calibration.

1.5. D2450V2 Dipole Calibration Certificate

	n i er tet filtent	- D-Illes 100101	China China		CALIBRATION
Add: No.51 Xueyuan Tel: +86-10-62304633	Road, Haidian Distri -2079 Fax: +8	6-10-62304633-2504	Cuma Maladalada		CNAS L0570
Client HTW	com nup.aw	ww.chinatti.ch	Certificate No:	Z21-60020	
	DTIEICATI	- 18 - 8 - 8 - 8		33.3	
CALIBRATION CE	RIFICATI		The second second		
Dbject	D2450V	2 - SN: 1009			1 A A
- 54-					
Calibration Procedure(s)	FF-Z11-	003-01			
	Calibrati	on Procedures f	or dipole validation kits		
Calibration date:	January	25, 2021			
	e e une pla ibre i	receability to pe	tional standards which	h realize the	physical units of
This calibration Certificate d	ocuments the t	be uncertainties	with confidence proba	bility are giver	on the following
neasurements(SI). The mea	tificate.				
Jages and are part at the set					
All calibrations have been	conducted in t	he closed labo	ratory facility: environ	ment tempera	ature(22±3)°C and
All calibrations have been humidity<70%.	conducted in t	he closed labo	ratory facility: environ	ment tempera	ature(22±3)°C and
All calibrations have been humidity<70%.	conducted in t	he closed labo	ratory facility: environ	ment tempera	ature(22±3)℃ and
All calibrations have been humidity<70%. Calibration Equipment used	conducted in t	he closed labo	ratory facility: environ	ment tempera	ature(22±3)℃ and
All calibrations have been humidity<70%. Calibration Equipment used (conducted in t (M&TE critical fo	he closed labor or calibration) Cal Date(Calit	ratory facility: environ	ment tempera	ature(22±3)°C and
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2	conducted in t (M&TE critical fo ID # 106276	he closed labor or calibration) Cal Date(Calit 12-May-20 (CT	ratory facility: environ prated by, Certificate N TL, No.J20X02965)	o.) Sched	ature(22±3)°C and
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A	Conducted in t (M&TE critical for ID # 106276 101369	he closed labor or calibration) Cal Date(Calit 12-May-20 (CT 12-May-20 (CT	ratory facility: environ prated by, Certificate N TL, No.J20X02965) TL, No.J20X02965)	o.) Sched	ature(22±3)℃ and luled Calibration May-21 May-21 Nay-21
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4	conducted in t (M&TE critical fo ID # 106276 101369 SN 7600	he closed labor or calibration) Cal Date(Calit 12-May-20 (CT 12-May-20 (CT 30-Nov-20(CT	ratory facility: environ orated by, Certificate N TL, No.J20X02965) TL, No.J20X02965) TL-SPEAG,No.Z20-604	o.) Sched	luled Calibration May-21 May-21 Nov-21 Eeb-21
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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: Z21-60020

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Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	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)

E-mail: cttl@chinattl.com htt	ments outside the sco	ppe of CNAS L0570)	
Appendix (Additional assess Antenna Parameters with Hea	ments outside the sco ad TSL	ope of CNAS L0570)	
Appendix (Additional assess Antenna Parameters with Hea	ments outside the sco ad TSL	ppe of CNAS L0570)	
Antenna Parameters with Hea	ad TSL		
Antenna Parameters with Hea	ad TSL		
Impedance, transformed to feed po			
	int	53.9Ω+ 2.04jΩ	
Return Loss		- 27.4dB	
2 22 2 22 2			
General Antenna Parameters	and Design		
Electrical Delay (one direction)		1.064 ns	
After long term use with 100W radia	ted power, only a slight wa	rming of the dipole near the	feedpoint can
be measured.			
The dipole is made of standard sem	irigid coaxial cable. The ce	nter conductor of the feeding	line is directly
connected to the second arm of the	dipole. The antenna is ther	efore short-circuited for DC-	signals. On some
of the dipoles, small end caps are a according to the position as explain	dded to the dipole arms in o ed in the "Measurement Co	order to improve matching w inditions" paragraph. The SA	nen loaded R data are not
affected by this change. The overall	dipole length is still accord	ing to the Standard.	
No excessive force must be applied	to the dipole arms, becaus	e they might bend or the sol	dered
connectione near the recuperint may	be duringed.		
Additional EUT Data			
Additional EUT Data			
Additional EUT Data		SPEAG	
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Extended Dipole Calibrations

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 (dP)		Real Impedance	Delta	Imaginary	Delta			
measurement	Return-1055 (ub)		(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			

The return loss is <-20dB, within 20% of prior calibration; the impedance is within 50hm of prior calibration. Therefore the verification result should support extended calibration.

1.6. D2600V2 Dipole Calibration Certificate

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Client HTW		and and	Octaniouto Iter		1211122
CALIBRATION CER	CHFICATE				
Dbject	D2600V2	- SN: 1150			
Calibration Procedure(s)	FF-Z11-0 Calibratio	03-01 on Procedures fo	or dipole validation kit	S	
Calibration date:	January	25, 2021			
al galler addition to the second					
humidity<70%. Calibration Equipment used (M&TE critical fo	r calibration)			
humidity<70%. Calibration Equipment used (Primary Standards	M&TE critical fo	r calibration) Cal Date(Calib	prated by, Certificate	No.) Sc	heduled Calibratio
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	r calibration) Cal Date(Calib 12-May-20 (CT 12-May-20 (CT 30-Nov-20(CT 10-Feb-20(CT)	orated by, Certificate TL, No.J20X02965) TL, No.J20X02965) TL-SPEAG,No.Z20-6 TL-SPEAG,No.Z20-6	No.) So 0421) 0017)	heduled Calibratio May-21 May-21 Nov-21 Feb-21
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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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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 cm3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.1 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	56.5 W/kg ± 18.8 % (k=2)
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	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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Add: No.51 Xueyuan Road, Haidian District Tel: +86-10-62304633-2079 E-mail: cttl@chinattl.com Appendix(Additional assessment Antenna Parameters with Head Ts Impedance, transformed to feed point Return Loss	e a ION LABORATO t, Beijing, 100191, -10-62304633-2504 w.chinattl.en s outside the SL	<u> αγ</u> China e scope of CNAS L0570) 49.5Ω- 6.58jΩ - 23.6dB
General Antenna Parameters and	Design	
connected to the second arm of the dipole of the dipoles, small end caps are added according to the position as explained in affected by this change. The overall dipol No excessive force must be applied to the connections near the feedpoint may be de	e, The antenna to the dipole ar the "Measurem e length is still e dipole arms, l amaged.	is therefore short-circuited for DC-signals. On s ms in order to improve matching when loaded ent Conditions" paragraph. The SAR data are n according to the Standard. because they might bend or the soldered
Additional EUT Data		SPEAG
	1	
	1	

Certificate No: Z21-60021

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Extended Dipole Calibrations

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 loss (dP)		Real Impedance	Delta	Imaginary	Delta
measurement	Return-ioss (ub)	Della (%)	(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

The return loss is <-20dB, within 20% of prior calibration; the impedance is within 50hm of prior calibration. Therefore the verification result should support extended calibration.

1.7. D5GHzV2 Dipole Calibration Certificate

Tel: +86-10-62304 E-mail: ettl@china	4633-2512 Fax: attl.com http:	+86-10-62304633-2504 //www.chinattl.cn	The Caladadada		CNAS L0570
Client HT	W	C	ertificate No:	Z21-60022	
CALIBRATION C	ERTIFICA	TE	and the second		
Object	D5GH	zV2 - SN: 1273			
Calibration Procedure(s)	EE 74	1 002 01			
	Calibr	ation Procedures for dip	ole validation kits		
Calibration date:	Incurs	26 2024			
ounoration date.	Janua	ry 26, 2021			
pages and are part of the c	ertificate.			and great on	ule lollowing
All calibrations have beer	n conducted in	the closed laboratory	facility: environm	nent temperature	(22±3)℃ and
All calibrations have been humidity<70%.	n conducted in	the closed laboratory	facility: environm	nent temperature	(22±3)℃ and
All calibrations have beer humidity<70%. Calibration Equipment used	n conducted in	the closed laboratory for calibration)	facility: environm	nent temperature	(22±3)℃ and
All calibrations have beer humidity<70%. Calibration Equipment used Primary Standards	ID #	the closed laboratory for calibration) Cal Date(Calibrated	facility: environm) Scheduled	(22±3)℃ and Calibration
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2	ID #	the closed laboratory for calibration) Cal Date(Calibrated 12-May-20 (CTTL, No	facility: environm by, Certificate No. J20X02965)	nent temperature) Scheduled Ma	(22±3)℃ and Calibration ay-21
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A Power sensor NRP6A	ID # 106276 101369	the closed laboratory for calibration) Cal Date(Calibrated 12-May-20 (CTTL, No 12-May-20 (CTTL, No	facility: environm by, Certificate No. .J20X02965) .J20X02965)) Schedluled Ma	(22±3)℃ and Calibration ay-21 ay-21
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4	ID # 106276 101369 SN 7600 SN 771	the closed laboratory for calibration) Cal Date(Calibrated 12-May-20 (CTTL, No 12-May-20 (CTTL, No 30-Nov-20 (CTTL-SPE	facility: environm by, Certificate No. .J20X02965) .J20X02965) AG,No.Z20-6042) Scheduled Ma Ma 1) No	(22±3)℃ and Calibration ay-21 ay-21 ov-21
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4	ID # 106276 101369 SN 7600 SN 771	the closed laboratory for calibration) Cal Date(Calibrated 12-May-20 (CTTL, No 12-May-20 (CTTL, No 30-Nov-20(CTTL-SPE 10-Feb-20(CTTL-SPE	facility: environm by, Certificate No. .J20X02965) .J20X02965) AG,No.Z20-6042 AG,No.Z20-60017) Schedluled Ma 1) No 7) Fe	(22±3)℃ and Calibration ay-21 ay-21 ov-21 ab-21
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A ReferenceProbe EX3DV4 DAE4 Secondary Standards	ID # 106276 101369 SN 7600 SN 771 ID #	the closed laboratory for calibration) Cal Date(Calibrated 12-May-20 (CTTL, No 12-May-20 (CTTL, No 30-Nov-20(CTTL-SPE 10-Feb-20(CTTL-SPE Cal Date(Calibrated b	facility: environm by, Certificate No. J20X02965) J20X02965) AG,No.Z20-6042 AG,No.Z20-60017 y, Certificate No.)) Scheduled Ma 1) No 7) Fe Scheduled	(22±3)°C and Calibration ay-21 ay-21 by-21 by-21 bb-21 Calibration
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	ID # 106276 101369 SN 7600 SN 771 ID # ID #	the closed laboratory for calibration) Cal Date(Calibrated 12-May-20 (CTTL, No 12-May-20 (CTTL, No 30-Nov-20(CTTL-SPE 10-Feb-20(CTTL-SPE Cal Date(Calibrated b 25-Feb-20 (CTTL, No.	facility: environm by, Certificate No. .J20X02965) .J20X02965) :AG,No.Z20-6042 AG,No.Z20-6001 y, Certificate No.) J20X00516)) Scheduled Ma 1) No 7) Fe Scheduled	(22±3)°C and Calibration ay-21 ay-21 ov-21 ov-21 bb-21 Calibration
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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: Z21-60022

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