



EX3DV4 - SN:7464

January 26, 2022

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7464

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (µV/(V/m) ²) ^A	0.46	0.44	0.45	± 10.1 %
DCP (mV) ^B	100.5	101.1	99.2	

Calibration Results for Modulation Response

UID	Communication System Name		A dB	B dBõV	С	D dB	VR mV	Max dev.	Max Unc ^E (k=2)
0	CW		0.00	0.00	1.00	0.00	129.8	±2.7 %	±4.7%
		Y	0.00	0.00	1.00		143.1		1
	the second s	Z	0.00	0.00	1.00		149.5	1	
10352-	Pulse Waveform (200Hz, 10%)	X	20.00	93.08	21.80	10.00	60.0	± 3.7 %	± 9.6 %
AAA		Y	20.00	91.15	21.40		60.0	1000	
X / X		Z	20.00	93.95	22.82		60.0	1	
10353-	Pulse Waveform (200Hz, 20%)	X	20.00	94.89	21.67	6.99	80.0	±2.0 %	± 9.6 %
AAA	and a set of the second second	Y	20.00	91.07	20.01		80.0		
		Z	20.00	94.48	22.03		80.0		
10354-	Pulse Waveform (200Hz, 40%)	X	20.00	100.94	23.29	3.98	95.0	± 1.1 %	±9.6 %
AAA		Y	20.00	91.64	18.69		95.0		100000
		Z	20.00	98.54	22.66		95.0		
10355-	Pulse Waveform (200Hz, 60%)	X	20.00	111.81	26.93	2.22	120.0	± 1.2 %	± 9.6 %
AAA		Y	20.00	91.67	17.31		120.0		
		Z	20.00	106.21	24.89		120.0	1	
10387-	QPSK Waveform, 1 MHz	X	1.95	67.66	16.42	1.00	150.0	±2.3%	± 9.6 %
AAA		Y	1.71	65.07	14.73	1100	150.0	1	
		Z	1.98	67.42	16.43		150.0	1	
10388-	QPSK Waveform, 10 MHz	X	2.73	71.10	17.33	0.00	150.0	± 0.9 %	± 9.6 %
AAA		Y	2.26	67.69	15.37		150.0		
	and the second sec	Z	2.79	71.26	17.38		150.0		
10396-	64-QAM Waveform, 100 kHz	X	3.50	72.58	19.72	3.01	150.0	±0.7 %	± 9.6 %
AAA		Y	3.46	71.32	18.87		150.0		1 0.0 70
		Z	3.75	73.23	20.03		150.0		
10399-	64-QAM Waveform, 40 MHz	X	3.79	68.38	16.54	0.00	150.0	± 2.0 %	± 9.6 %
AAA	The second second second second second	Y	3.52	66.93	15.61	0.00	150.0		1 3.0 70
		Z	3.82	68.42	16.57		150.0	1	
10414-	WLAN CCDF, 64-QAM, 40MHz	X	4.98	65.65	15.65	0.00	150.0	± 3.8 %	± 9.6 %
AAA		Y	4.98	65.46	15.42		150.0		/0
		Z	5.02	65.62	15.64		150.0	1	

Note: For details on UID parameters see Appendix

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 Pages 5 and 6).

^B Numerical linearization parameter: uncertainty not required. ^E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

Certificate No: EX3-7464_Jan22

Page 3 of 23





EX3DV4- SN:7464

January 26, 2022

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7464

Sensor Model Parameters

	C1 fF	C2 fF	α V ⁻¹	T1 ms.V ⁻²	T2 ms.V ⁻¹	T3 ms	T4 V ⁻²	T5 V ⁻¹	Т6
Х	61.5	458.49	35.65	15.95	0.16	5.10	0.72	0.47	1.01
Y	63.7	481.59	36.30	14.98	0.81	5.06	0.73	0.58	1.01
Z	68.2	509.89	35.77	20.70	0.43	5.10	0.63	0.55	1.01

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-150.6
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

Note: Measurement distance from surface can be increased to 3-4 mm for an Area Scan job.

Certificate No: EX3-7464_Jan22

Page 4 of 23





EX3DV4- SN:7464

January 26, 2022

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7464

f (MHz) ^c	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unc (k=2)
64	54.2	0.75	13.80	13.80	13.80	0.00	1.00	± 13.3 %
150	52.3	0.76	11.94	11.94	11.94	0.00	1.00	± 13.3 %
300	45.3	0.87	11.78	11.78	11.78	0.09	1.00	± 13.3 %
450	43.5	0.87	11.02	11.02	11.02	0.16	1.30	± 13.3 %
750	41.9	0.89	10.26	10.26	10.26	0.56	0.81	± 12.0 %
835	41.5	0.90	9.96	9.96	9.96	0.41	0.91	± 12.0 %
900	41.5	0.97	9.72	9.72	9.72	0.52	0.80	± 12.0 %
1450	40.5	1.20	8.86	8.86	8.86	0.43	0.80	± 12.0 %
1640	40.2	1.31	8.64	8.64	8.64	0.33	0.86	± 12.0 %
1750	40.1	1.37	8.52	8.52	8.52	0.39	0.86	± 12.0 %
1810	40.0	1.40	8.20	8.20	8.20	0.37	0.86	± 12.0 %
1900	40.0	1.40	8.18	8.18	8.18	0.35	0.86	± 12.0 %
2000	40.0	1.40	8.20	8.20	8.20	0.34	0.86	± 12.0 %
2100	39.8	1.49	8.38	8.38	8.38	0.32	0.86	± 12.0 %
2300	39.5	1.67	8.36	8.36	8.36	0.32	0.90	± 12.0 %
2450	39.2	1.80	7.77	7.77	7.77	0.36	0.90	± 12.0 %
2600	39.0	1.96	7.64	7.64	7.64	0.40	0.90	± 12.0 %
3300	38.2	2.71	7.27	7.27	7.27	0.30	1.35	± 13.1 %
3500	37.9	2.91	7.20	7.20	7.20	0.30	1.35	± 13.1 %
3700	37.7	3.12	6.78	6.78	6.78	0.30	1.35	± 13.1 %
3900	37.5	3.32	6.76	6.76	6.76	0.40	1.60	± 13.1 %
4100	37.2	3.53	6.71	6.71	6.71	0.40	1.60	± 13.1 %
4200	37.1	3.63	6.60	6.60	6.60	0.40	1.70	± 13.1 %
4400	36.9	3.84	6.53	6.53	6.53	0.40	1.70	± 13.1 %
4600	36.7	4.04	6.40	6.40	6.40	0.40	1.70	± 13.1 %
4800	36.4	4.25	6.35	6.35	6.35	0.40	1.80	± 13.1 %
4950	36.3	4.40	6.00	6.00	6.00	0.40	1.80	± 13.1 %
5200	36.0	4.66	5.60	5.60	5.60	0.40	1.80	± 13.1 %
5250	35.9	4.71	5.43	5.43	5.43	0.40	1.80	± 13.1 %
5300	35.9	4.76	5.32	5.32	5.32	0.40	1.80	± 13.1 %
5500	35.6	4.96	5.11	5.11	5.11	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.91	4.91	4.91	0.40	1.80	± 13.1 %
5750	35.4	5.22	4.85	4.85	4.85	0.40	1.80	± 13.1 %
5800	35.3	5.27	5.00	5.00	5.00	0.40	1.80	± 13.1 %

Calibration Parameter Determined in Head Tissue Simulating Media

^C Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the 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. Validity of ConvF assessed at 6 MHz is 4-9 MHz, and ConvF assessed at 13 MHz is 9-19 MHz. Above 5 GHz frequency validity can be extended to ± 110 MHz.
 ^F At frequencies 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 frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

Certificate No: EX3-7464 Jan22

Page 5 of 23







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

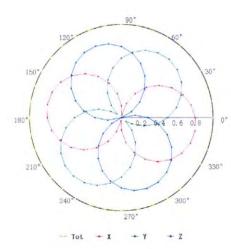
 Tel: +86-10-62304633-2512
 Fax: +86-10-62304633-2504

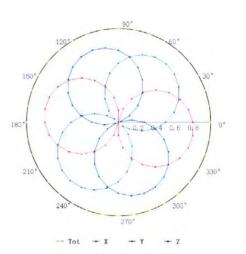
 E-mail: cttl@chinattl.com
 <u>Http://www.chinattl.cn</u>

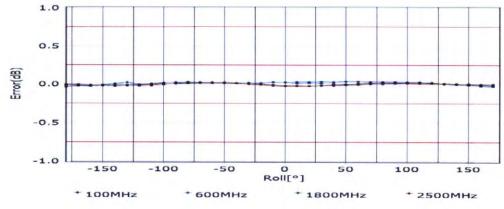
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM

f=1800 MHz, R22







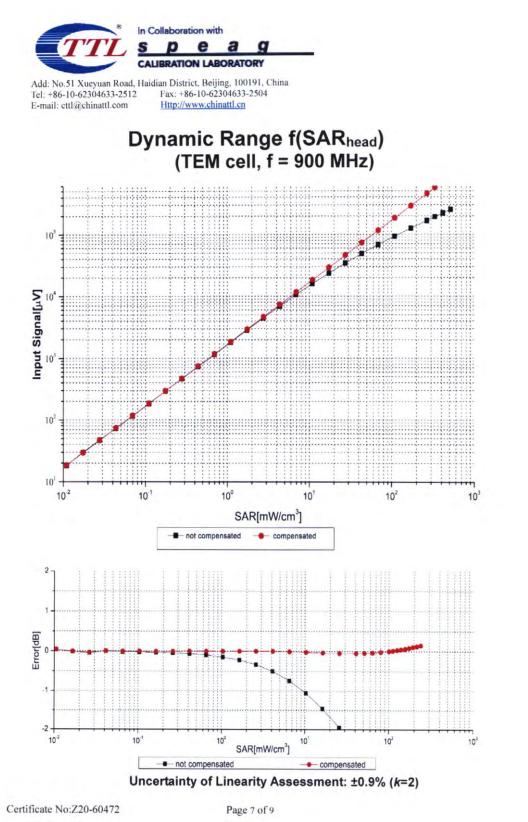
Uncertainty of Axial Isotropy Assessment: ±1.2% (k=2)

Certificate No:Z20-60472

Page 6 of 9













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

 Tel: +86-10-62304633-2512

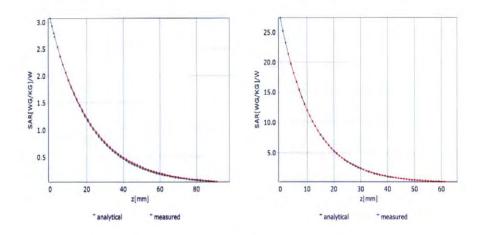
 E-mail: cttl@chinattl.com

Fax: +86-10-62304633-2504
Http://www.chinattl.cn

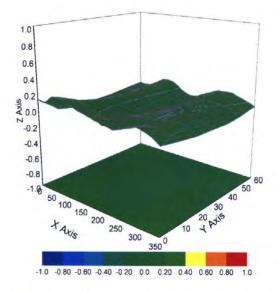
Conversion Factor Assessment

f=750 MHz,WGLS R9(H_convF)

f=1750 MHz,WGLS R22(H_convF)



Deviation from Isotropy in Liquid



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

Certificate No:Z20-60472

Page 8 of 9







DASY/EASY – Parameters of Probe: EX3DV4 – SN:7464

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	30.7
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	10mm
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:Z20-60472

Page 9 of 9





Probe 7600 Calibration Certificate

EX3DV4 - SN : 7600 F-Z11-004-02 Calibration Procedures for Dosimetric E-field Probes December 29, 2021 is the traceability to national standards, which realize the physical units of its and the uncertainties with confidence probability are given on the following ed in the closed laboratory facility: environment temperature(22±3)°C and itical for calibration) # Cal Date(Calibrated by, Certificate No.) Scheduled Calibration 19 15-Jun-21(CTTL, No.J21X04466) Jun-22 i47 15-Jun-21(CTTL, No.J21X04466) Jun-22 i48 15-Jun-21(CTTL, No.J21X04466) Jun-22 i48 15-Jun-21(CTTL, No.J21X04466) Jun-22 i48 15-Jun-21(CTTL, No.J20X00525) Feb-22 i50W-10dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 i617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22	Power Meter NRP2 101919 15-Jun-21(CTTL, No.J21X04466) Jun-22 Power sensor NRP-Z91 101547 15-Jun-21(CTTL, No.J21X04466) Jun-22 Power sensor NRP-Z91 101547 15-Jun-21(CTTL, No.J21X04466) Jun-22 Power sensor NRP-Z91 101548 15-Jun-21(CTTL, No.J21X04466) Jun-22 Reference 10dBAttenuator 18N50W-10dB 10-Feb-20(CTTL, No.J20X00525) Feb-22 Reference 20dBAttenuator 18N50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 Reference Probe EX3DV4 SN 3617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22 DAE4 SN 1555 20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22
F-Z11-004-02 Calibration Procedures for Dosimetric E-field Probes December 29, 2021 as the traceability to national standards, which realize the physical units of is and the uncertainties with confidence probability are given on the following ad in the closed laboratory facility: environment temperature(22±3)°C and attical for calibration) Interview Cal Date(Calibrated by, Certificate No.) Scheduled Calibration Interview Cal Date(Calibrated by, Certificate No.) Scheduled Calibration Interview	Calibration Procedure(s) FF-Z11-004-02 Calibration Procedures for Dosimetric E-field Probes Calibration date: December 29, 2021 This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate. All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)°C and humidity<70%. Calibration Equipment used (M&TE critical for calibration) Primary Standards ID # Cal Date(Calibrated by, Certificate No.) Scheduled Calibration Jun-22 Power sensor NRP-291 101547 15-Jun-21(CTTL, No.J21X04466) Jun-22 Power sensor NRP-291 101548 15-Jun-21(CTTL, No.J20X00525) Feb-22 Reference 10dBAttenuator 18N50W-10dB 10-Feb-20(CTTL, No.J20X00525) Feb-22 Reference Probe EX3DV4 SN 3617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22 Na 1555 20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22
Calibration Procedures for Dosimetric E-field Probes December 29, 2021 as the traceability to national standards, which realize the physical units of the and the uncertainties with confidence probability are given on the following and the uncertainties with confidence probability are given on the following and the uncertainties with confidence probability are given on the following and the uncertainties with confidence probability are given on the following and the closed laboratory facility: environment temperature(22±3)°C and attical for calibration) bitical for calibration) bitical for calibration) bitical for calibration bitical for calibration) bitical for calibration bitical for calibratin bitical for calibr	FF-Z11-004-02 Calibration Procedures for Dosimetric E-field Probes Calibration date: December 29, 2021 This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate. All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)°C and humidity<70%. Calibration Equipment used (M&TE critical for calibration) Primary Standards ID # Cal Date(Calibrated by, Certificate No.) Scheduled Calibration Power Meter NRP2 101919 15-Jun-21(CTTL, No.J21X04466) Jun-22 Power sensor NRP-Z91 101547 15-Jun-21(CTTL, No.J21X04466) Jun-22 Power sensor NRP-Z91 101548 15-Jun-21(CTTL, No.J21X04466) Jun-22 Power sensor NRP-Z91 101548 15-Jun-21(CTTL, No.J20X00525) Feb-22 Reference 10dBAttenuator 18N50W-10dB 10-Feb-20(CTTL, No.J20X00525) Feb-22 Reference Probe EX3DV4 SN 3617 27-Jan-21(SPEAG, No.DAE4-1555_Aug21/2) Jan-22 SN 1555 20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22
s the traceability to national standards, which realize the physical units of the and the uncertainties with confidence probability are given on the following and the uncertainties with confidence probability are given on the following and in the closed laboratory facility: environment temperature(22±3)°C and itical for calibration) <u>Cal Date(Calibrated by, Certificate No.)</u> Scheduled Calibration <u>Scheduled Calibration</u> <u>Cal Date(Calibrated by, Certificate No.)</u> Scheduled Calibration <u>Scheduled Calibration</u> <u>Scheduled Calibration</u> <u>Jun-22</u> <u>Scheduled Calibration</u> <u>Scheduled Calibration</u> <u>Scheduled Calibration</u> <u>Jun-22</u> <u>Scheduled Calibration</u> <u>Jun-22</u> <u>Jun-21</u> <u>Jun-21</u> <u>Scheduled Calibration</u> <u>Jun-22</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Jun-21</u> <u>Ju</u>	December 29, 2021 December 29, 2021 This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate. All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)°C and humidity<70%.
titical for calibration) Cal Date(Calibrated by, Certificate No.) Scheduled Calibration Cal Date(Calibrated by, Certificate No.) Scheduled Calibration 19 15-Jun-21(CTTL, No.J21X04466) Jun-22 47 15-Jun-21(CTTL, No.J21X04466) Jun-22 48 15-Jun-21(CTTL, No.J21X04466) Jun-22 50W-10dB 10-Feb-20(CTTL, No.J20X00525) Feb-22 50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 50W-20DB 10-Feb-20(CTL, No.J20	measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate. All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)°C and humidity<70%.
447 15-Jun-21(CTTL, No.J21X04466) Jun-22 448 15-Jun-21(CTTL, No.J21X04466) Jun-22 50W-10dB 10-Feb-20(CTTL, No.J20X00525) Feb-22 50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22	Power sensor NRP-Z91 101547 15-Jun-21(CTTL, No.J21X04466) Jun-22 Power sensor NRP-Z91 101548 15-Jun-21(CTTL, No.J21X04466) Jun-22 Reference 10dBAttenuator 18N50W-10dB 10-Feb-20(CTTL, No.J20X00525) Feb-22 Reference 20dBAttenuator 18N50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 Reference Probe EX3DV4 SN 3617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22 DAE4 SN 1555 20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22
i48 15-Jun-21(CTTL, No.J21X04466) Jun-22 50W-10dB 10-Feb-20(CTTL, No.J20X00525) Feb-22 50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22	Power sensor NRP-Z91 101548 15-Jun-21(CTTL, No.J21X04466) Jun-22 Reference 10dBAttenuator 18N50W-10dB 10-Feb-20(CTTL, No.J20X00525) Feb-22 Reference 20dBAttenuator 18N50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 Reference Probe EX3DV4 SN 3617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22 DAE4 SN 1555 20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22
50W-10dB 10-Feb-20(CTTL, No.J20X00525) Feb-22 50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22	Reference 10dBAttenuator 18N50W-10dB 10-Feb-20(CTTL, No.J20X00525) Feb-22 Reference 20dBAttenuator 18N50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 Reference Probe EX3DV4 10-Feb-20(CTTL, No.J20X00526) Feb-22 SN 3617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22 SN 1555 20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22
50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22	Reference 20dBAttenuator 18N50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 Reference Probe EX3DV4 SN 3617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22 DAE4 SN 1555 20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22
617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22	Reference Probe EX3DV4 SN 3617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22 DAE4 SN 1555 20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22
555 20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22	
Cal Date(Calibrated by, Certificate No.) Scheduled Calibration	Secondary Standards ID # Cal Date(Calibrated by, Certificate No.) Scheduled Calibration
Scheduled Calibration	SignalGenerator MG3700A 6201052605 16-Jun-21(CTTL, No.J21X04467) Jun-22
052605 16-Jun-21(CTTL, No.J21X04467) Jun-22	
052605 16-Jun-21(CTTL, No.J21X04467) Jun-22 6110673 14-Jan-21 (CTTL, No.J21X00232) Jan -22	
052605 16-Jun-21(CTTL, No.J21X04467) Jun-22 6110673 14-Jan-21 (CTTL, No.J21X00232) Jan -22 Function Signature	Name Function Signature
052605 16-Jun-21(CTTL, No.J21X04467) Jun-22 6110673 14-Jan-21 (CTTL, No.J21X00232) Jan -22 Function Signature	Name Function Signature
052605 16-Jun-21(CTTL, No.J21X04467) Jun-22 6110673 14-Jan-21 (CTTL, No.J21X00232) Jan -22 Function Signature	Calibrated by: Yu Zongying SAR Test Engineer
052605 16-Jun-21(CTTL, No.J21X04467) Jun-22 6110673 14-Jan-21 (CTTL, No.J21X00232) Jan -22 Function Signature sAR Test Engineer SAR Test Engineer	Name Function Signature Calibrated by: Yu Zongying SAR Test Engineer Reviewed by: Lin Hao SAR Test Engineer
	SignalGenerator MG3700A 6201052605 16-Jun-21(CTTL, No.J21X04467) Jun-2
	S S S S S S S S S S S S S S S S S S S
052605 16-Jun-21(CTTL, No.J21X04467) Jun-22	Network Analyzes EE0740 INV40440070 44 1 04 (OTT) N. ISAVOSSON
052605 16-Jun-21(CTTL, No.J21X04467) Jun-22	Network Analyzer E5071C MY46110673 14-Jan-21 (CTTL, No.J21X00232) Jan -22
052605 16-Jun-21(CTTL, No.J21X04467) Jun-22	Network Analyzer E5071C MY46110673 14-Jan-21 (CTTL, No.J21X00232) Jan -22
052605 16-Jun-21(CTTL, No.J21X04467) Jun-22	Network Analyzer E5071C MY46110673 14-Jan-21 (CTTL, No.J21X00232) Jan -22
052605 16-Jun-21(CTTL, No.J21X04467) Jun-22	Network Analyzer E5071C MY46110673 14- Jan-21 (CTTL No. 121X00232) Jon. 22
052605 16-Jun-21(CTTL, No.J21X04467) Jun-22	Notwork Apply Ter EE071C NVAC110672 14 Jac D4 (OTT) No 104V000000
052605 16-Jun-21(CTTL, No.J21X04467) Jun-22	
	Guilt Contraction of the second
Service and a standard inter of alloration	SignalGenerator MG3700A 6201052605 16-Jun-21(CTTL, No.J21X04467) Jun-22
Cal Date(Calibrated by Certificate No.) Scheduled Calibration	
Cal Date(Calibrated by Certificate No.) Scheduled Calibration	
Cal Date(Calibrated by Certificate No.) Scheduled Calibration	
Cal Date(Calibrated by Certificate No.) Scheduled Calibration	
Cal Date(Calibrated by Certificate No.) Scheduled Calibration	Secondary Standards ID # Cal Date(Calibrated by, Certificate No.) Scheduled Calibration
Cal Date(Calibrated by Certificate No.) Scheduled Calibration	
Cal Date(Calibrated by Certificate No.) Scheduled Calibration	Secondary Standards ID # Cal Date(Calibrated by, Certificate No.) Scheduled Calibration
Cal Date(Calibrated by Certificate No.) Scheduled Calibration	
Cal Date(Calibrated by Certificate No.) Scheduled Calibration	Secondary Standards ID # Calibrated by, Certificate No.) Scheduled Calibration
Cal Date(Calibrated by Certificate No.) Scheduled Calibration	
Cal Date(Calibrated by Certificate No.) Scheduled Calibration	
Cal Date(Calibrated by Certificate No.) Scheduled Calibration	
Cal Date(Calibrated by Certificate No.) Scheduled Calibration	Secondary Standards ID # Cal Date(Calibrated by, Certificate No.) Scheduled Calibration
	Coopdany Plandards ID# OutDate (OutDate
20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22	
555 20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22	
555 20-Aug-21/SPEAG No DAE4 1555 Aug21/2) Aug 22	
	DAE4 SN 1555 20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22
	DAE4 SN 1555 20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22
617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22	Reference Probe EX3DV4 SN 3617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22 DAE4 SN 1555 20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22
50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22	Reference 20dBAttenuator 18N50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 Reference Probe EX3DV4 SN 3617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22 DAE4 SN 1555 20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22
50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22	Reference 20dBAttenuator 18N50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 Reference Probe EX3DV4 SN 3617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22 DAE4 SN 1555 20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22
50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22	Reference 20dBAttenuator 18N50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 Reference Probe EX3DV4 SN 3617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22 DAE4 SN 1555 20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22
50W-10dB 10-Feb-20(CTTL, No.J20X00525) Feb-22 50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22	Reference 10dBAttenuator 18N50W-10dB 10-Feb-20(CTTL, No.J20X00525) Feb-22 Reference 20dBAttenuator 18N50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 Reference Probe EX3DV4 10-Feb-20(CTTL, No.J20X00526) Feb-22 N 3617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22 N 1555 20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22
50W-10dB 10-Feb-20(CTTL, No.J20X00525) Feb-22 50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22	Reference 10dBAttenuator 18N50W-10dB 10-Feb-20(CTTL, No.J20X00525) Feb-22 Reference 20dBAttenuator 18N50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 Reference Probe EX3DV4 10-Feb-20(CTTL, No.J20X00526) Feb-22 N 3617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22 N 1555 20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22
i48 15-Jun-21(CTTL, No.J21X04466) Jun-22 50W-10dB 10-Feb-20(CTTL, No.J20X00525) Feb-22 50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22	Power sensor NRP-Z91 101548 15-Jun-21(CTTL, No.J21X04466) Jun-22 Reference 10dBAttenuator 18N50W-10dB 10-Feb-20(CTTL, No.J20X00525) Feb-22 Reference 20dBAttenuator 18N50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 Reference Probe EX3DV4 SN 3617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22 DAE4 SN 1555 20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22
i48 15-Jun-21(CTTL, No.J21X04466) Jun-22 50W-10dB 10-Feb-20(CTTL, No.J20X00525) Feb-22 50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22	Power sensor NRP-Z91 101548 15-Jun-21(CTTL, No.J21X04466) Jun-22 Reference 10dBAttenuator 18N50W-10dB 10-Feb-20(CTTL, No.J20X00525) Feb-22 Reference 20dBAttenuator 18N50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 Reference Problem EX3DV4 SN 3617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22 DAE4 SN 1555 20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22
447 15-Jun-21(CTTL, No.J21X04466) Jun-22 448 15-Jun-21(CTTL, No.J21X04466) Jun-22 50W-10dB 10-Feb-20(CTTL, No.J20X00525) Feb-22 50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22	Power sensor NRP-Z91 101547 15-Jun-21(CTTL, No.J21X04466) Jun-22 Power sensor NRP-Z91 101548 15-Jun-21(CTTL, No.J21X04466) Jun-22 Reference 10dBAttenuator 18N50W-10dB 10-Feb-20(CTTL, No.J20X00525) Feb-22 Reference 20dBAttenuator 18N50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 Reference Probe EX3DV4 SN 3617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22 DAE4 SN 1555 20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22
447 15-Jun-21(CTTL, No.J21X04466) Jun-22 448 15-Jun-21(CTTL, No.J21X04466) Jun-22 50W-10dB 10-Feb-20(CTTL, No.J20X00525) Feb-22 50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22	Power sensor NRP-Z91 101547 15-Jun-21(CTTL, No.J21X04466) Jun-22 Power sensor NRP-Z91 101548 15-Jun-21(CTTL, No.J21X04466) Jun-22 Reference 10dBAttenuator 18N50W-10dB 10-Feb-20(CTTL, No.J20X00525) Feb-22 Reference 20dBAttenuator 18N50W-20dB 10-Feb-20(CTTL, No.J20X00526) Feb-22 Reference Probe EX3DV4 SN 3617 27-Jan-21(SPEAG, No.EX3-3617_Jan21) Jan-22 DAE4 SN 1555 20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22
555 20-Aug-21(SPEAG, No.DAE4-1555_Aug21/2) Aug-22	







Tel: +86-10-62304633-2512 E-mail: cttl@chinattl.com

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Fax: +86-10-62304633-2504 Http://www.chinattl.cn

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 E^2 -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:Z21-60455

Page 2 of 9









DASY/EASY – Parameters of Probe: EX3DV4 – SN:7600

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm(µV/(V/m) ²) ^A	0.69	0.66	0.68	±10.0%
DCP(mV) ^B	109.3	109.7	110.7	

Modulation Calibration Parameters

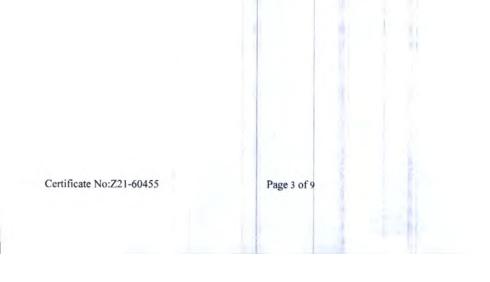
UID	Communication System Name		A dB	B dBõV	C	D dB	VR mV	Unc ^E (<i>k</i> =2)
0 CW	CW	X	0.0	0.0	1.0	0.00	212.0	±2.1%
		Y	0.0	0.0	1.0		204.3	
		Z	0.0	0.0	1.0		208.9	

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.









Tel: +86-10-62304633-2512 E-mail: cttl@chinattl.com

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Fax: +86-10-62304633-2504 Http://www.chinattl.cn

DASY/EASY – Parameters of Probe: EX3DV4 – SN:7600

Calibration Parameter Determined in Head Tissue Simulating Media

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	10.74	10.74	10.74	0.16	1.27	±12.1%
900	41.5	0.97	10.27	10.27	10.27	0.15	1.43	±12.1%
1450	40.5	1.20	9.18	9.18	9.18	0.18	1.09	±12.1%
1750	40.1	1.37	8.93	8.93	8.93	0.20	0.95	±12.1%
1900	40.0	1.40	8.54	8.54	8.54	0.25	1.06	±12.1%
2100	39.8	1.49	8.44	8.44	8.44	0.22	1.18	±12.1%
2300	39.5	1.67	8.14	8.14	8.14	0.59	0.72	±12.1%
2450	39.2	1.80	7.82	7.82	7.82	0.47	0.82	±12.1%
2600	39.0	1.96	7.62	7.62	7.62	0.50	0.81	±12.1%
3300	38.2	2.71	7.34	7.34	7.34	0.37	1.04	±13.3%
3500	37.9	2.91	7.05	7.05	7.05	0.39	1.00	±13.3%
3700	37.7	3.12	6.78	6.78	6.78	0.40	1.00	±13.3%
3900	37.5	3.32	6.68	6.68	6.68	0.40	1.25	±13.3%
4100	37.2	3.53	6.71	6.71	6.71	0.40	1.15	±13.3%
4200	37.1	3.63	6.61	6.61	6.61	0.35	1.35	±13.3%
4400	36.9	3.84	6.50	6.50	6.50	0.35	1.35	±13.3%
4600	36.7	4.04	6.40	6.40	6.40	0.40	1.30	±13.3%
4800	36.4	4.25	6.33	6.33	6.33	0.40	1.30	±13.3%
4950	36.3	4.40	6.09	6.09	6.09	0.40	1.35	±13.3%
5250	35.9	4.71	5.59	5.59	5.59	0.40	1.47	±13.3%
5600	35.5	5.07	5.13	5.13	5.13	0.50	1.25	±13.3%
5750	35.4	5.22	5.16	5.16	5.16	0.55	1.15	±13.3%

^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:Z21-60455

Page 4 of 9



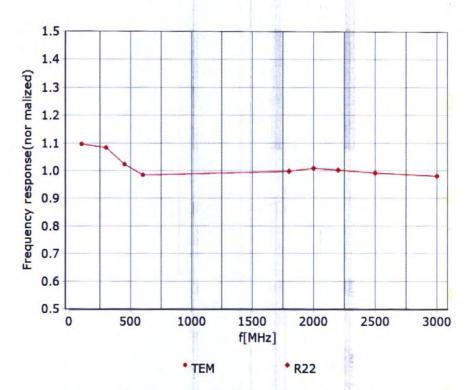




Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-62304633-2512 E-mail: cttl@chinattl.com

Fax: +86-10-62304633-2504 Http://www.chinattl.cn

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



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

Certificate No:Z21-60455

Page 5 of 9

©Copyright. All rights reserved by CTTL.

Page 280 of 379







 Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China

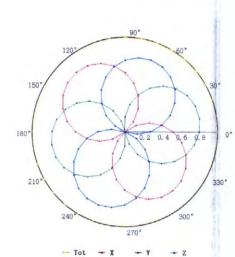
 Tel: +86-10-62304633-2512
 Fax: +86-10-62304633-2504

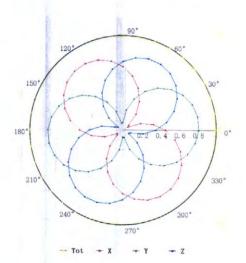
 E-mail: cttl@chinattl.com
 <u>Http://www.chinattl.cn</u>

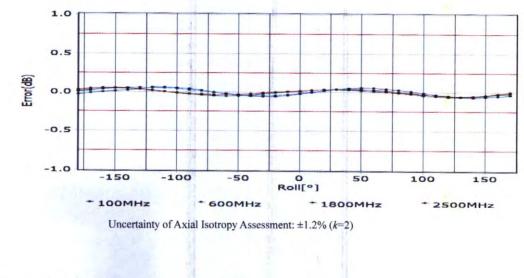
Receiving Pattern (Φ), θ=0°

f=600 MHz, TEM

f=1800 MHz, R22





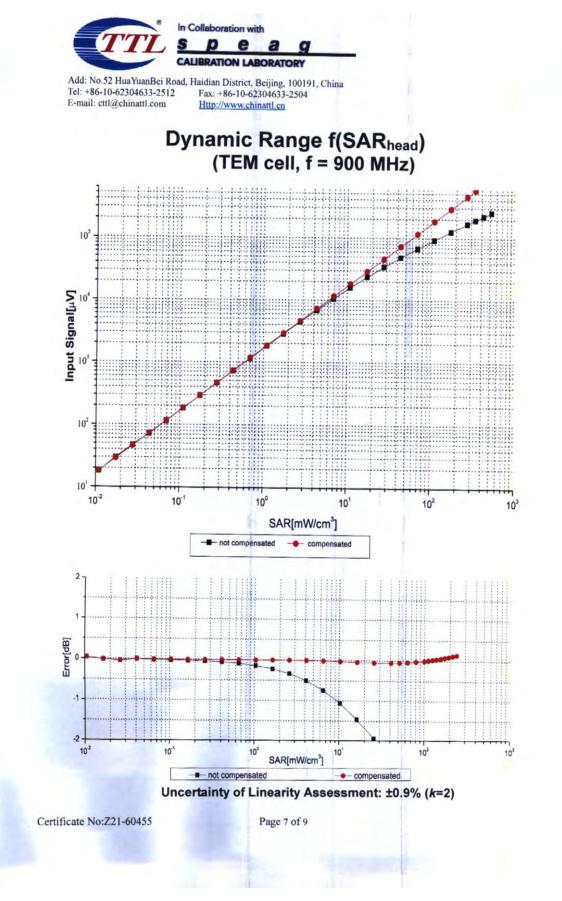


Certificate No:Z21-60455

Page 6 of 9











60

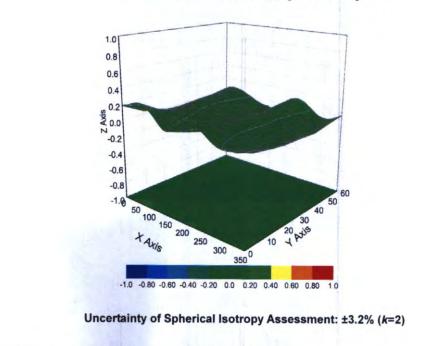


Tel: +86-10-62304633-2512 Fax: +86-10-62304633-2504 E-mail: cttl@chinattl.com Http://www.chinattl.cn

Conversion Factor Assessment

f=750 MHz,WGLS R9(H_convF) f=1750 MHz,WGLS R22(H_convF) 3.0 25.0 2.5 20.0 2.0 2.0 1.5 1.0 1.5 1.0 M/[SX/SM]15.0 10.0 1.0 5.0 0.5 0 20 40 60 80 0 10 20 30 40 50 z[mm] z[mm] analytica * analytical sured

Deviation from Isotropy in Liquid



Certificate No:Z21-60455

Page 8 of 9







DASY/EASY - Parameters of Probe: EX3DV4 - SN:7600

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	40.7
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:Z21-60455

Page 9 of 9









ANNEX H Dipole Calibration Certificate

750 MHz Dipole Calibration Certificate

agina abbin asso 10, 0004 Earlein,	Switzerland	C S	Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service
ccredited by the Swiss Accreditation ne Swiss Accreditation Service i ultilateral Agreement for the rec	s one of the signatories	s to the EA	ccreditation No.: SCS 0108
lient CTTL (Auden)			: D750V3-1017_Jul22
CALIBRATION C	ERTIFICATE		
Dbject	D750V3 - SN:101	17	
Calibration procedure(s)	QA CAL-05.v11 Calibration Proce	dure for SAR Validation Sources	between 0.7-3 GHz
Calibration date:	July 20, 2022	and all the second second second second	The Alter of Children and
All calibrations have been conducte	ed in the closed laborator	y facility: environment temperature (22 \pm 3)°C	C and humidity < 70%.
Calibration Equipment used (M&TE	critical for calibration)		
Calibration Equipment used (M&TE Primary Standards	critical for calibration)	Cal Date (Certificate No.)	Scheduled Calibration
Calibration Equipment used (M&TE Primary Standards Power meter NRP	critical for calibration)	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524)	Scheduled Calibration Apr-23
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91	critical for calibration)	Cal Date (Certificate No.)	Scheduled Calibration
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91	critical for calibration) ID # SN: 104778 SN: 103244	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524)	Scheduled Calibration Apr-23 Apr-23
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator	Critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525)	Scheduled Calibration Apr-23 Apr-23 Apr-23
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4	ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 7349	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4	ID # SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Apr-23
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards	Critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID #	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B	ID # SN: 104778 SN: 103244 SN: 103245 SN: B19394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349 Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A	ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 601 ID # SN: GB39512475 SN: US37292783	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A	ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06	ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: 100972	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06	ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: 100972	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A	critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: US41080477 Name	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20) 31-Mar-14 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
All calibrations have been conducte Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A Calibrated by:	initial for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: 100972 SN: US41080477	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20) 31-Mar-14 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A Calibrated by:	critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: US41080477 Name	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20) 31-Mar-14 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A	critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 601 ID # SN: 601 ID # SN: GB39512475 SN: US37292783 SN: 100972 SN: US41080477 Name Aidonia Georgladou	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349 Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20) 31-Mar-14 (in house check Oct-20) Summer Content of the term of term of the term of term o	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22





Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

oloosuly.	
TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,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-Worn 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) DASY 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 source is mounted in a touch configuration below the center marking of the flat phantom.
- Return Loss: This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. 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: D750V3-1017_Jul22

Page 2 of 6

s to the EA





Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
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	40.5 ± 6 %	0.90 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.19 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.63 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR averaged over 10 cm ³ (10 g) of Head TSL SAR measured	condition 250 mW input power	1.43 W/kg

Certificate No: D750V3-1017_Jul22

Page 3 of 6





Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.7 Ω - 0.5 jΩ
Return Loss	- 29.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.034 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

Certificate No: D750V3-1017_Jul22

Page 4 of 6





DASY5 Validation Report for Head TSL

Date: 20.07.2022

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1017

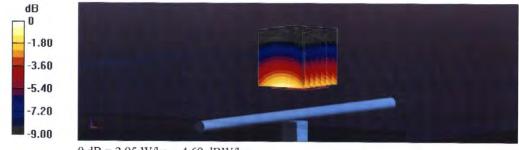
Communication System: UID 0 - CW; Frequency: 750 MHz Medium parameters used: f = 750 MHz; σ = 0.9 S/m; ϵ_r = 40.5; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(10.11, 10.11, 10.11) @ 750 MHz; Calibrated: 31.12.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.05.2022
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 59.72 V/m; Power Drift = 0.04 dB Peak SAR (extrapolated) = 3.34 W/kg SAR(1 g) = 2.19 W/kg; SAR(10 g) = 1.43 W/kg Smallest distance from peaks to all points 3 dB below = 24.2 mm Ratio of SAR at M2 to SAR at M1 = 65.3% Maximum value of SAR (measured) = 2.95 W/kg



0 dB = 2.95 W/kg = 4.69 dBW/kg

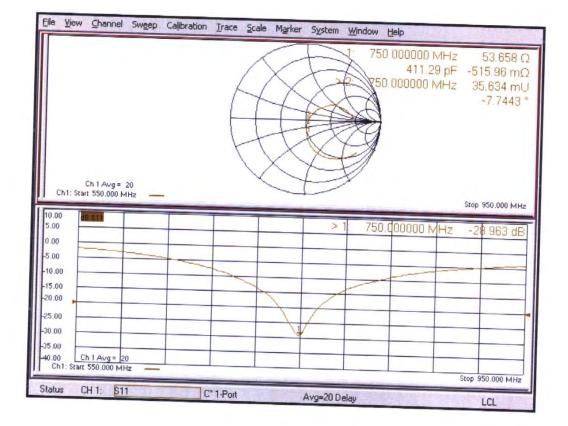
Certificate No: D750V3-1017_Jul22

Page 5 of 6









Certificate No: D750V3-1017_Jul22

Page 6 of 6





900 MHz Dipole Calibration Certificate

Engineering AG aughausstrasse 43, 8004 Zurich,	Switzerland		Service suisse d'étalonnage Servizio svizzero di taratura
ccredited by the Swiss Accreditation he Swiss Accreditation Service in Iultilateral Agreement for the rec	is one of the signatorie	s to the EA	ccreditation No.: SCS 0108
CALIBRATION C	EDTIEICATI		o: D900V2-1d051_Jul22
Dbject	D900V2 - SN:1d0		
Calibration procedure(s)	QA CAL-05.v11 Calibration Proce	dure for SAR Validation Sources	s between 0.7-3 GHz
Calibration date:	July 26, 2022	and the second second	
	ed in the closed laborator	y facility: environment temperature $(22 \pm 3)^{\circ}$	nd are part of the certificate. C and humidity < 70%.
Calibration Equipment used (M&TE	ed in the closed laborator		
Calibration Equipment used (M&TE Primary Standards Power meter NRP	ed in the closed laborator critical for calibration) ID # SN: 104778	y facility: environment temperature (22 ± 3)° Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524)	C and humidity < 70%. Scheduled Calibration Apr-23
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91	ad in the closed laborator critical for calibration) ID # SN: 104778 SN: 103244	y facility: environment temperature (22 ± 3)° <u>Cal Date (Certificate No.)</u> 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524)	C and humidity < 70%. Scheduled Calibration Apr-23 Apr-23
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91	ed in the closed laborator critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245	y facility: environment temperature (22 ± 3)° <u>Cal Date (Certificate No.)</u> 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525)	C and humidity < 70%. Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator	ed in the closed laborator critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k)	y facility: environment temperature (22 ± 3)° <u>Cal Date (Certificate No.)</u> 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527)	C and humidity < 70%. Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Fype-N mismatch combination	ed in the closed laborator critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245	y facility: environment temperature (22 ± 3)° <u>Cal Date (Certificate No.)</u> 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528)	C and humidity < 70%. Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Apr-23
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Fype-N mismatch combination Reference Probe EX3DV4	ed in the closed laborator critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327	y facility: environment temperature (22 ± 3)° <u>Cal Date (Certificate No.)</u> 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527)	C and humidity < 70%. Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4	ed in the closed laborator critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601	y facility: environment temperature (22 ± 3)° Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22)	C and humidity < 70%. Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards	ed in the closed laborator critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID #	y facility: environment temperature (22 ± 3)° Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house)	C and humidity < 70%. Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Fype-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B	ed in the closed laborator critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601	y facility: environment temperature (22 ± 3)° Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22)	C and humidity < 70%. Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A	ed in the closed laborator critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475	Y facility: environment temperature (22 ± 3)° Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20)	C and humidity < 70%. Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Fype-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06	ed in the closed laborator critical for calibration) ID # SN: 104778 SN: 103244 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: 100972	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20)	C and humidity < 70%. Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Fype-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06	ed in the closed laborator critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 103245 SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20)	C and humidity < 70%. Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06	ed in the closed laborator critical for calibration) ID # SN: 104778 SN: 103244 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: 100972	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20)	C and humidity < 70%. Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In hous
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A	ed in the closed laborator critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 103245 SN: 103245 SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: WY41093315 SN: 100972 SN: US41080477	Y facility: environment temperature (22 ± 3)° Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20) 31-Mar-14 (in house check Oct-20)	C and humidity < 70%. Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In hous
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A	ed in the closed laborator critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 103245 SN: 103245 SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: WY41093315 SN: 100972 SN: US41080477 Name	Y facility: environment temperature (22 ± 3)* Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20) 31-Mar-14 (in house check Oct-20)	C and humidity < 70%. Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-291 Power sensor NRP-291 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A Calibrated by: Approved by:	ed in the closed laborator critical for calibration) ID # SN: 104778 SN: 103244 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: 100972 SN: US41080477 Name Michael Weber Sven Kühn	Y facility: environment temperature (22 ± 3)* Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349 Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20) 31-Mar-14 (in house check Oct-20)	C and humidity < 70%. Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check:

©Copyright. All rights reserved by CTTL.





Calibration Laboratory of Schmid & Partner **Engineering AG** Zeughausstrasse 43, 8004 Zurich, Switzerland



Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service

Accreditation No.: SCS 0108

S

C

S

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,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-Worn 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) DASY 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 source is mounted in a touch configuration below the center marking of the flat phantom.
- Return Loss: This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. 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: D900V2-1d051 Jul22

Page 2 of 6

©Copyright. All rights reserved by CTTL.





Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	900 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	0.97 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.1 ± 6 %	0.95 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.74 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	11.0 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR averaged over 10 cm ³ (10 g) of Head TSL SAR measured	condition 250 mW input power	1.75 W/kg

Certificate No: D900V2-1d051_Jul22

Page 3 of 6





Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.4 Ω + 1.0 jΩ
Return Loss	- 35.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.407 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG	
-----------------	-------	--

Certificate No: D900V2-1d051_Jul22

Page 4 of 6





DASY5 Validation Report for Head TSL

Date: 26.07.2022

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:1d051

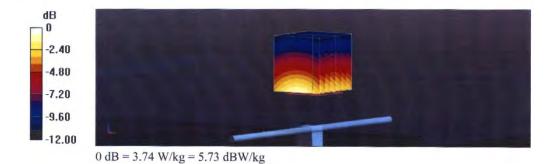
Communication System: UID 0 - CW; Frequency: 900 MHz Medium parameters used: f = 900 MHz; $\sigma = 0.95$ S/m; $\varepsilon_r = 40.1$; $\rho = 1000$ kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(9.62, 9.62, 9.62) @ 900 MHz; Calibrated: 31.12.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.05.2022
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 66.34 V/m; Power Drift = 0.02 dB Peak SAR (extrapolated) = 4.26 W/kg SAR(1 g) = 2.74 W/kg; SAR(10 g) = 1.75 W/kg Smallest distance from peaks to all points 3 dB below = 16.8 mm Ratio of SAR at M2 to SAR at M1 = 64.2% Maximum value of SAR (measured) = 3.74 W/kg



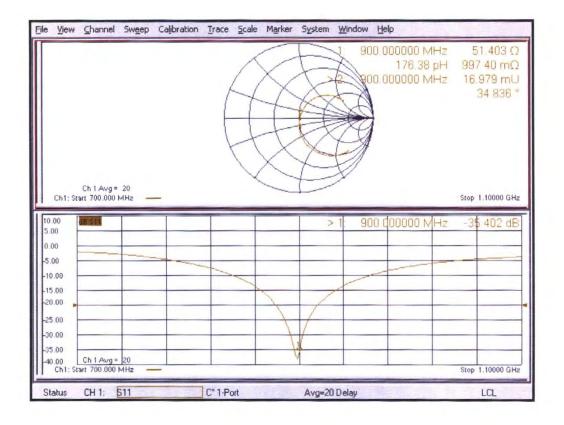
Certificate No: D900V2-1d051_Jul22

Page 5 of 6





Impedance Measurement Plot for Head TSL



Certificate No: D900V2-1d051_Jul22

Page 6 of 6

Page 297 of 379





1750 MHz Dipole Calibration Certificate

eughausstrasse 43, 8004 Zurich,	Of Switzerland		 Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service
Accredited by the Swiss Accreditation The Swiss Accreditation Service in Multilateral Agreement for the rec	s one of the signatorie	s to the EA	Accreditation No.: SCS 0108
CALIBRATION C	EDTIEICATI		No: D1750V2-1003_Jul22
	D1750V2 - SN:10		
Calibration procedure(s)	QA CAL-05.v11 Calibration Proce	edure for SAR Validation Source	es between 0.7-3 GHz
Calibration date:	July 18, 2022	n	
All calibrations have been conducte	ed in the closed laborator	ry facility: environment temperature (22 ± 3)°C and humidity < 70%.
Calibration Equipment used (M&TE			
Calibration Equipment used (M&TE Primary Standards	critical for calibration)	y facility: environment temperature (22 ± 3 Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524))°C and humidity < 70%. Scheduled Calibration Apr-23
Calibration Equipment used (M&TE rimary Standards Yower meter NRP	critical for calibration)	Cal Date (Certificate No.)	Scheduled Calibration
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91	critical for calibration) ID # SN: 104778	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524)	Scheduled Calibration Apr-23
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator	critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k)	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524)	Scheduled Calibration Apr-23 Apr-23
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Sype-N mismatch combination	critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528)	Scheduled Calibration Apr-23 Apr-23 Apr-23
rimary Standards ower meter NRP ower sensor NRP-Z91 ower sensor NRP-Z91 eference 20 dB Attenuator ype-N mismatch combination leference Probe EX3DV4	critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k)	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 PAE4	Critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23
Calibration Equipment used (M&TE trimary Standards tower meter NRP tower sensor NRP-Z91 tower sensor NRP-Z91 teference 20 dB Attenuator ype-N mismatch combination teference Probe EX3DV4 tAE4 tecondary Standards	critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22
calibration Equipment used (M&TE trimary Standards lower meter NRP lower sensor NRP-Z91 teference 20 dB Attenuator ype-N mismatch combination teference Probe EX3DV4 iAE4 lecondary Standards lower meter E4419B	Critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID #	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check
Calibration Equipment used (M&TE trimary Standards tower meter NRP tower sensor NRP-Z91 Reference 20 dB Attenuator type-N mismatch combination Reference Probe EX3DV4 VAE4 Recondary Standards tower meter E4419B tower sensor HP 8481A	Critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22
rimary Standards ower meter NRP ower sensor NRP-Z91 ower sensor NRP-Z91 ower sensor NRP-Z91 teference 20 dB Attenuator ype-N mismatch combination teference Probe EX3DV4 /AE4 econdary Standards ower meter E4419B ower sensor HP 8481A ower sensor HP 8481A	Critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22
rimary Standards ower meter NRP ower sensor NRP-Z91 ower sensor NRP-Z91 ower sensor NRP-Z91 teference 20 dB Attenuator ype-N mismatch combination teference Probe EX3DV4 /AE4 econdary Standards ower meter E4419B ower sensor HP 8481A ower sensor HP 8481A ower sensor HP 8481A Figenerator R&S SMT-06	ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A Regenerator R&S SMT-06 Network Analyzer Agilent E8358A	ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 310982 / 06327 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: 100972 SN: US41080477 Name	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20) 31-Mar-14 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
	critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: 100972 SN: US41080477	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20) 31-Mar-14 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A	ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 310982 / 06327 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: 100972 SN: US41080477 Name	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20) 31-Mar-14 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22

Certificate No: D1750V2-1003_Jul22

Page 1 of 6





Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,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-Worn 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) DASY 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 source is mounted in a touch configuration below the center marking of the flat phantom.
- Return Loss: This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. 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: D1750V2-1003_Jul22

Page 2 of 6

er marking of the flat phantom.





Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
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	38.5 ± 6 %	1.35 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.19 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	36.8 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR averaged over 10 cm ³ (10 g) of Head TSL SAR measured	condition 250 mW input power	4.82 W/kg

Certificate No: D1750V2-1003_Jul22

Page 3 of 6





Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.7 Ω - 0.2 jΩ	
Return Loss	- 43.0 dB	

General Antenna Parameters and Design

Electrical Delay (one direction)	1.214 ns	
----------------------------------	----------	--

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG	
-----------------	-------	--

Certificate No: D1750V2-1003_Jul22

Page 4 of 6





DASY5 Validation Report for Head TSL

Date: 18.07.2022

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1003

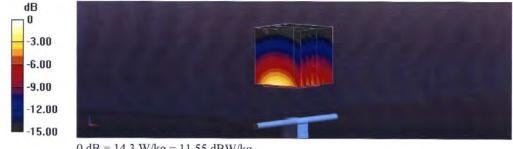
Communication System: UID 0 - CW; Frequency: 1750 MHz Medium parameters used: f = 1750 MHz; $\sigma = 1.35 \text{ S/m}$; $\varepsilon_r = 38.5$; $\rho = 1000 \text{ kg/m}^3$ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(8.67, 8.67, 8.67) @ 1750 MHz; Calibrated: 31.12.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.05.2022 .
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 107.5 V/m; Power Drift = 0.05 dB Peak SAR (extrapolated) = 17.3 W/kg SAR(1 g) = 9.19 W/kg; SAR(10 g) = 4.82 W/kg Smallest distance from peaks to all points 3 dB below = 10 mm Ratio of SAR at M2 to SAR at M1 = 53.4% Maximum value of SAR (measured) = 14.3 W/kg



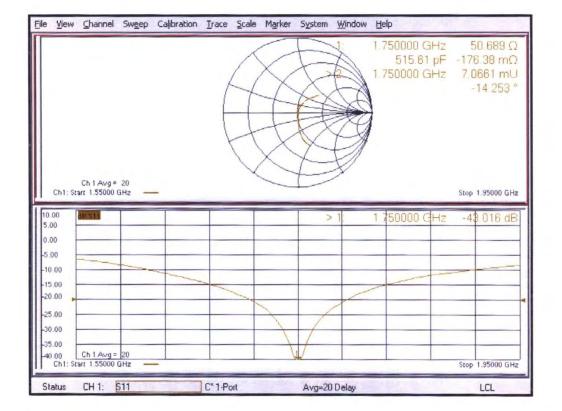
0 dB = 14.3 W/kg = 11.55 dBW/kg

Certificate No: D1750V2-1003_Jul22

Page 5 of 6







Impedance Measurement Plot for Head TSL

Certificate No: D1750V2-1003_Jul22

Page 6 of 6

©Copyright. All rights reserved by CTTL.

Page 303 of 379





1900 MHz Dipole Calibration Certificate

Schmid & Partner Engineering AG eughausstrasse 43, 8004 Zurich,	of Switzerland		Service suisse d'étalonnage
accredited by the Swiss Accreditation The Swiss Accreditation Service in Multilateral Agreement for the rec	is one of the signatorie	s to the EA	Accreditation No.: SCS 0108
Client CTTL (Auden)		Certificate N	lo: D1900V2-5d101_Jul22
CALIBRATION C	ERTIFICATI		经上设 转回 重调
Dbject	D1900V2 - SN:50	1101	
Calibration procedure(s)	QA CAL-05.v11 Calibration Proce	edure for SAR Validation Source	s between 0.7-3 GHz
Calibration date:	July 26, 2022	and the part of th	
The measurements and the uncerta	ainties with confidence pr	onal standards, which realize the physical ur robability are given on the following pages a y facility: environment temperature (22 ± 3)°	nd are part of the certificate.
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-22 (No. 217-03525/03524)	Apr-23
ower sensor NRP-Z91	SN: 103244	04-Apr-22 (No. 217-03524)	Apr-23
Power sensor NRP-Z91	SN: 103245	04-Apr-22 (No. 217-03525)	Apr-23
Reference 20 dB Attenuator	SN: BH9394 (20k)	04-Apr-22 (No. 217-03527)	
ype-N mismatch combination Reference Probe EX3DV4	SN: 310982 / 06327 SN: 7349		Apr-23
		04-Apr-22 (No. 217-03528)	Apr-23 Apr-23
DAE4	SN: 601	04-Apr-22 (No. 217-03526) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22)	Apr-23
		31-Dec-21 (No. EX3-7349_Dec21)	Apr-23 Apr-23 Dec-22
Secondary Standards	SN: 601	31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22)	Apr-23 Apr-23 Dec-22 May-23
Secondary Standards Power meter E4419B Power sensor HP 8481A	SN: 601 ID # SN: GB39512475 SN: US37292783	31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house)	Apr-23 Apr-23 Dec-22 May-23 Scheduled Check
Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A	SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315	31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 07-Oct-15 (in house check Oct-20)	Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06	SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: 100972	31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20)	Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06	SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: 100972	31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 07-Oct-15 (in house check Oct-20)	Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A	SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: 100972 SN: US41080477 Name	31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20) 31-Mar-14 (in house check Oct-20) Function	Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A	SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: 100972 SN: US41080477	31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20) 31-Mar-14 (in house check Oct-20)	Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A Calibrated by:	SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: 100972 SN: US41080477 Name	31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20) 31-Mar-14 (in house check Oct-20) Function	Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A Calibrated by:	SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: 100972 SN: US41080477 Name Michael Weber	31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20) 31-Mar-14 (in house check Oct-20) Function	Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A Calibrated by: Approved by: This calibration certificate shall not	SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: 100972 SN: US41080477 Name Michael Weber Sven Kühn	31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20) 31-Mar-14 (in house check Oct-20) Function	Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 Signature

©Copyright. All rights reserved by CTTL.





Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland



Schweizerischer Kalibrierdienst Service suisse d'étalonnage

C Service suisse d'etalonnage Servizio svizzero di taratura

S

S Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,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-Worn 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) DASY 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 source is mounted in a touch configuration below the center marking of the flat phantom.
- Return Loss: This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. 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: D1900V2-5d101_Jul22

Page 2 of 6





Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
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	38.7 ± 6 %	1.38 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.90 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	39.7 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR averaged over 10 cm ³ (10 g) of Head TSL SAR measured	condition 250 mW input power	5.18 W/kg

Certificate No: D1900V2-5d101_Jul22

Page 3 of 6





Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.1 Ω + 4.3 jΩ	
Return Loss	- 26.5 dB	

General Antenna Parameters and Design

Electrical Delay (one direction)	1.202 ns	
----------------------------------	----------	--

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG

Certificate No: D1900V2-5d101_Jul22

Page 4 of 6





DASY5 Validation Report for Head TSL

Date: 26.07.2022

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d101

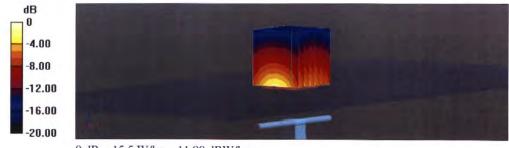
Communication System: UID 0 - CW; Frequency: 1900 MHz Medium parameters used: f = 1900 MHz; σ = 1.38 S/m; ϵ_r = 38.7; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(8.43, 8.43, 8.43) @ 1900 MHz; Calibrated: 31.12.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.05.2022
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 109.0 V/m; Power Drift = 0.09 dB Peak SAR (extrapolated) = 18.5 W/kg SAR(1 g) = 9.90 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 = 54.1% Maximum value of SAR (measured) = 15.5 W/kg



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

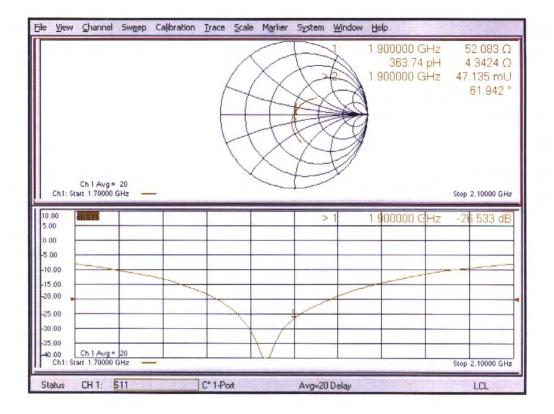
Certificate No: D1900V2-5d101_Jul22

Page 5 of 6





Impedance Measurement Plot for Head TSL



Certificate No: D1900V2-5d101_Jul22

Page 6 of 6





2300 MHz Dipole Calibration Certificate

Engineering AG ughausstrasse 43, 8004 Zurich,	Switzerland	C S	Servizio svizzero di taratura Swiss Calibration Service
credited by the Swiss Accreditation e Swiss Accreditation Service i			ccreditation No.: SCS 0108
ultilateral Agreement for the rec	ognition of calibration	certificates	
lient CTTL (Auden)	A DE ANTE AND A DE ANTE	Certificate No	D2300V2-1018_Jul22
CALIBRATION C	ERTIFICATI	E - E - Y - S - Ala	
Dbject	D2300V2 - SN:10	018	
	OA CAL OF		
Calibration procedure(s)	QA CAL-05.v11 Calibration Proce	edure for SAR Validation Sources	between 0.7-3 GHz
	Cambranon 11000		
	1.4.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1		Fall in the second second
Calibration date:	July 20, 2022		A STORE OF MERINA AT
salutation date.	July 20, 2022		
All calibrations have been conducte	ed in the closed laborator	robability are given on the following pages an ry facility: environment temperature $(22 \pm 3)^{\circ}$	C and humidity < 70%.
Calibration Equipment used (M&TE	critical for calibration)	ry facility: environment temperature (22 ± 3)°(
Calibration Equipment used (M&TE Primary Standards	critical for calibration)	ry facility: environment temperature (22 ± 3)°(Cal Date (Certificate No.)	Scheduled Calibration
Calibration Equipment used (M&TE Primary Standards Power meter NRP	critical for calibration)	ry facility: environment temperature (22 ± 3)°(
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91	critical for calibration)	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524)	Scheduled Calibration Apr-23
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator	critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k)	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524)	Scheduled Calibration Apr-23 Apr-23
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Fype-N mismatch combination	ID # SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Apr-23
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Fype-N mismatch combination Reference Probe EX3DV4	ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 7349	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4	ID # SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Apr-23
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Fype-N mismatch combination Reference Probe EX3DV4 DAE4	ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 7349	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B	ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A	critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A	ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Fype-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06	critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: 100972	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Fype-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06	ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E44198 Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A	critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: 100972 SN: US41080477 Name	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20) 31-Mar-14 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A	critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: 100972 SN: US41080477	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20) 31-Mar-14 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A Calibrated by:	critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: 100972 SN: US41080477 Name Aldonia Georgiadou	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349 Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20) 31-Mar-14 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A Calibrated by:	critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: 100972 SN: US41080477 Name	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349_Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20) 31-Mar-14 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A Calibrated by:	critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 8H9394 (20k) SN: 310982 / 06327 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: 100972 SN: US41080477 Name Aldonia Georgiadou	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349 Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20) 31-Mar-14 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22 Signature Magaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A Calibrated by: Approved by:	critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 310982 / 06327 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: 100972 SN: US41080477 Name Aldonia Georgiadou Sven Kühn	Cal Date (Certificate No.) 04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 31-Dec-21 (No. EX3-7349 Dec21) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 15-Jun-15 (in house check Oct-20) 31-Mar-14 (in house check Oct-20)	Scheduled Calibration Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22 Signature S. J. S. J. Issued: July 21, 2022





Calibration Laboratory of Schmid & Partner

Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,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-Worn 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) DASY 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 source is mounted in a touch configuration below the center marking of the flat phantom.
- Return Loss: This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). The Return Loss ensures low reflected power. 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: D2300V2-1018_Jul22

Page 2 of 6





Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2300 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.5	1.67 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.4 ± 6 %	1.69 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	12.6 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	49.6 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR averaged over 10 cm ³ (10 g) of Head TSL SAR measured	condition 250 mW input power	6.09 W/kg

Certificate No: D2300V2-1018_Jul22

Page 3 of 6





Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.8 Ω - 2.6 jΩ
Return Loss	- 30.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.168 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

SPEAG

Certificate No: D2300V2-1018_Jul22

Page 4 of 6





DASY5 Validation Report for Head TSL

Date: 20.07.2022

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2300 MHz; Type: D2300V2; Serial: D2300V2 - SN:1018

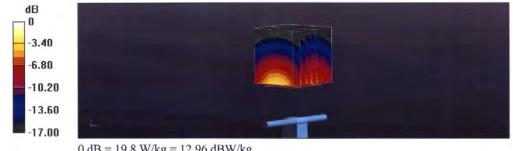
Communication System: UID 0 - CW; Frequency: 2300 MHz Medium parameters used: f = 2300 MHz; $\sigma = 1.69 \text{ S/m}$; $\varepsilon_r = 38.4$; $\rho = 1000 \text{ kg/m}^3$ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(7.98, 7.98, 7.98) @ 2300 MHz; Calibrated: 31.12.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.05.2022
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001 •
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501) .

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 116.8 V/m; Power Drift = 0.04 dB Peak SAR (extrapolated) = 23.0 W/kg SAR(1 g) = 12.6 W/kg; SAR(10 g) = 6.09 W/kg Smallest distance from peaks to all points 3 dB below = 9 mm Ratio of SAR at M2 to SAR at M1 = 54.9% Maximum value of SAR (measured) = 19.8 W/kg



0 dB = 19.8 W/kg = 12.96 dBW/kg

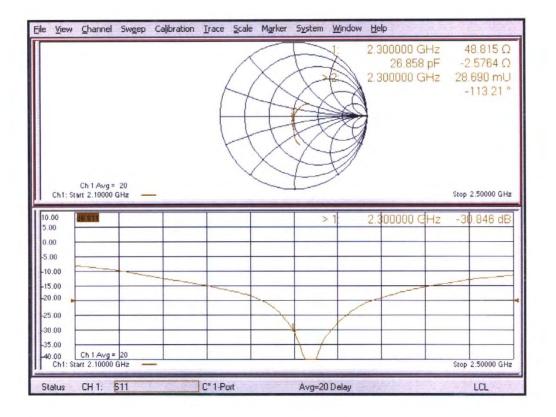
Certificate No: D2300V2-1018_Jul22

Page 5 of 6





Impedance Measurement Plot for Head TSL



Certificate No: D2300V2-1018_Jul22

Page 6 of 6