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



S ACCREDITATION S C S

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Accreditation No.: SCS 0108

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%.

### **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	38.5 ± 6 %	1.72 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

### SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	12.7 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	49.7 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.11 W/kg

SAR measured	250 mW input power	6.11 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.1 W/kg ± 16.5 % (k=2)

### Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.6 Ω - 3.5 jΩ
Return Loss	- 29.1 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.170 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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

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

### Additional EUT Data

٢	anufactured by	SPEAG

### DASY5 Validation Report for Head TSL

Date: 13.07.2021

Test Laboratory: SPEAG, Zurich, Switzerland

### DUT: Dipole 2300 MHz; Type: D2300V2; Serial: D2300V2 - SN:1088

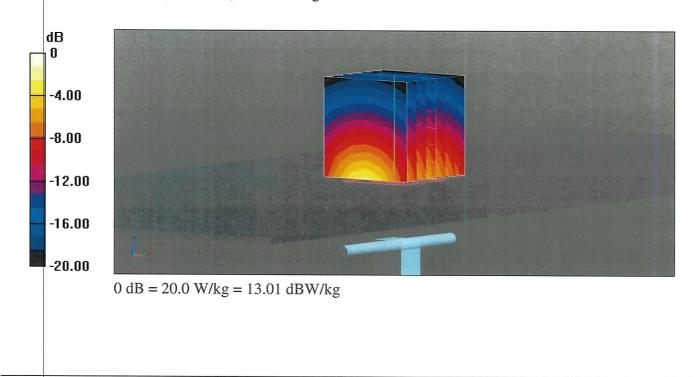
Communication System: UID 0 - CW; Frequency: 2300 MHz Medium parameters used: f = 2300 MHz;  $\sigma = 1.72$  S/m;  $\varepsilon_r = 38.5$ ;  $\rho = 1000$  kg/m<sup>3</sup> Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY 52 Configuration:

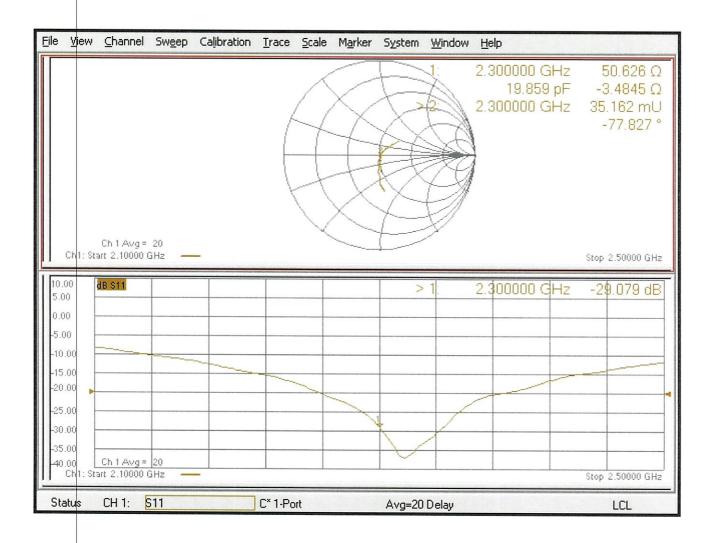
- Probe: EX3DV4 SN7349; ConvF(7.98, 7.98, 7.98) @ 2300 MHz; Calibrated: 28.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 116.7 V/m; Power Drift = 0.08 dB Peak SAR (extrapolated) = 23.3 W/kg SAR(1 g) = 12.7 W/kg; SAR(10 g) = 6.11 W/kg Smallest distance from peaks to all points 3 dB below = 9 mm Ratio of SAR at M2 to SAR at M1 = 54.6% Maximum value of SAR (measured) = 20.0 W/kg



### Impedance Measurement Plot for Head TSL





### D2300V2, serial no. 1088 Extended Dipole Calibrations

Referring to KDB 450824, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

### <Justification of the extended calibration>

D <b>2300</b> V2 – serial no. <b>1088</b>						
	2300MHZ					
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
07.13.2021 (Cal. Report)	-29.079		50.626		-3.4845	
07.12.2022 (extended)	-31.845	9.51	48.295	2.331	-3.0620	-0.4225

The return loss is < -20dB, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.



511 Log Mag 10.00dB/ Ref 0.000dB [F1] >1 2.3000000 GHz -31.845 dB 0.000 IFBW 70 kHz Stop 2.5 GHz Cor Start 2.1 GHz r1 S11 Smith (R+jX) Scale 1.000U [F1 Del] >1 2.3000000 GHz 48.295 Ω -3.0620 Ω 22.599 pF Stop 2.5 GHz Cor 1 Start 2.1 GHz IFBW 70 kHz

<Dipole Verification Data> - D2300 V2, serial no. 1088 (Data of Measurement : 07.12.2022) 2300 MHz - Head

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#### Sporton Client

Certificate No: D2450V2-929\_Nov19

# **CALIBRATION CERTIFICATE**

Object	D2450V2 - SN:92	29	
Calibration procedure(s)	QA CAL-05.v11 Calibration Proce	dure for SAR Validation Sources	between 0.7-3 GHz
Calibration date:	November 21, 20	019	
		onal standards, which realize the physical uni robability are given on the following pages an	
All calibrations have been conducte	d in the closed laborato	ry facility: environment temperature (22 $\pm$ 3)°C	C and humidity < 70%.
Calibration Equipment used (M&TE	critical for calibration)		
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	03-Apr-19 (No. 217-02892/02893)	Apr-20
Power sensor NRP-Z91	SN: 103244	03-Apr-19 (No. 217-02892)	Apr-20
Power sensor NRP-Z91	SN: 103245	03-Apr-19 (No. 217-02893)	Apr-20
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-19 (No. 217-02894)	Apr-20
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-19 (No. 217-02895)	Apr-20
Reference Probe EX3DV4	SN: 7349	29-May-19 (No. EX3-7349_May19)	May-20
DAE4	SN: 601	30-Apr-19 (No. DAE4-601_Apr19)	Apr-20
Secondary Standards	1D #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Feb-19)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-19)	In house check: Oct-20
	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	Jes 145
This calibration certificate shall not	be reproduced except in	full without written approval of the laboratory.	Issued: November 25, 2019

### Calibration Laboratory of

Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





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### Glossarv:

TO	ticque cimulating liquid
TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured
1 N/ 7 N	not applicable of not medealed

### 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"

### **Additional Documentation:**

e) DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

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

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

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### **Measurement Conditions**

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

DASY Version	DASY5	V52.10.3
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

# Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.2 ± 6 %	1.84 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

### SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.5 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	53.1 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.24 W/kg

### Appendix (Additional assessments outside the scope of SCS 0108)

### **Antenna Parameters with Head TSL**

Impedance, transformed to feed point	52.6 Ω + 5.2 jΩ
Return Loss	- 24.9 dB

### **General Antenna Parameters and Design**

Electrical Delay (one direction)	1.161 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

### **DASY5 Validation Report for Head TSL**

Date: 21.11.2019

Test Laboratory: SPEAG, Zurich, Switzerland

### DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:929

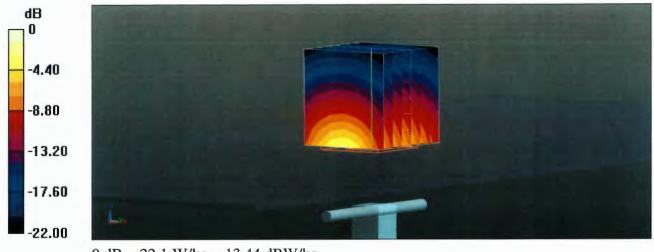
Communication System: UID 0 - CW; Frequency: 2450 MHz Medium parameters used: f = 2450 MHz;  $\sigma$  = 1.84 S/m;  $\epsilon_r$  = 38.2;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

### DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(7.9, 7.9, 7.9) @ 2450 MHz; Calibrated: 29.05.2019
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.3(1513); SEMCAD X 14.6.13(7474)

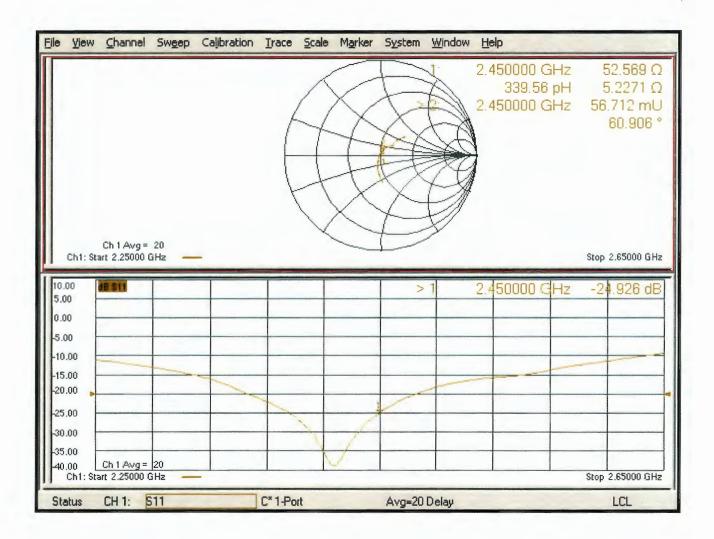
### Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 117.5 V/m; Power Drift = 0.07 dB Peak SAR (extrapolated) = 26.8 W/kg **SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.24 W/kg** Smallest distance from peaks to all points 3 dB below = 9 mm Ratio of SAR at M2 to SAR at M1 = 50.9% Maximum value of SAR (measured) = 22.1 W/kg



0 dB = 22.1 W/kg = 13.44 dBW/kg

### Impedance Measurement Plot for Head TSL



### Appendix: Transfer Calibration at Four Validation Locations on SAM Head<sup>1</sup>

### **Evaluation Condition**

Phantom	SAM Head Phantom	For usage with cSAR3DV2-R/L
Fnantom	SAIVI Flead Fliamon	TOT USage WILL COALOD V2-11/L

### SAR result with SAM Head (Top $\cong$ C0)

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	normalized to 1W	56.6 W/kg ± 17.5 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	

### SAR result with SAM Head (Mouth $\cong$ F90)

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	normalized to 1W	57.7 W/kg ± 17.5 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
CAN averaged over 10 cm (10 g) of field TOE	Contaition	

### SAR result with SAM Head (Neck $\cong$ H0)

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	normalized to 1W	54.4 W/kg ± 17.5 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	

### SAR result with SAM Head (Ear $\cong$ D90)

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	normalized to 1W	34.8 W/kg ± 17.5 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	

<sup>1</sup> Additional assessments outside the current scope of SCS 0108



### D2450V2, serial no. 929 Extended Dipole Calibrations

Referring to KDB 450824, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

### <Justification of the extended calibration>

			D <b>2450</b> V2 – serial no. 9	29		
			245	0MHZ		
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
11.21.2019 (Cal. Report)	-24.926		52.569		5.2271	
11.20.2020 (extended)	-26.971	8.20	50.932	-1.637	4.4757	-0.7514
11.19.2021 (extended)	-23.805	-4.50	50.843	-1.726	5.6695	0.4424

The return loss is < -20dB, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.

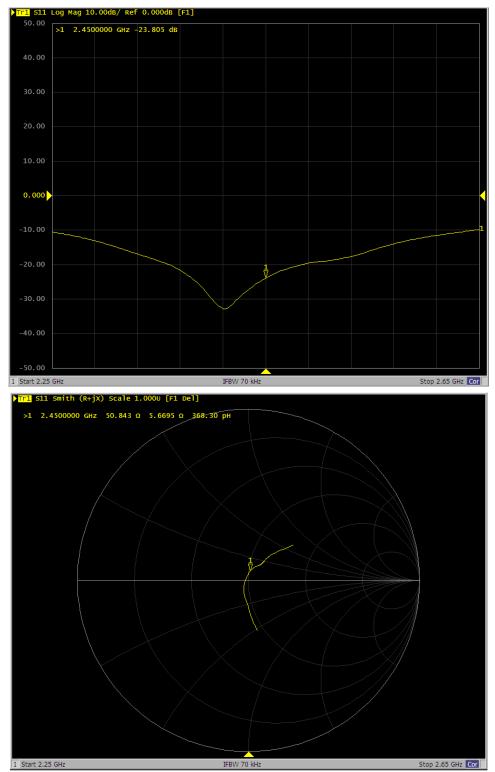


L 511 Log Mag 10.00dB/ Ref 0.000dB [F1] >1 2.4500000 GHz -26.971 dB 20.00 0.000 -30.00 -40.00 1 Start 2.25 GHz IFBW 70 kHz Stop 2.65 GHz Cor Tr1 S11 Smith (R+jX) Scale 1.000U [F1 Del] >1 2.4500000 GHz 50.932 Ω 4.4757 Ω 290.75 pH 1 Start 2.25 GHz IFBW 70 kHz Stop 2.65 GHz Cor

<Dipole Verification Data> - D2450 V2, serial no. 929 (Data of Measurement : 11.20.2020) 2450 MHz - Head



<Dipole Verification Data> - D2450 V2, serial no. 929 (Data of Measurement : 11.19.2021) 2450 MHz - Head



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### Client Sporton

### Certificate No: D2600V2-1008\_Aug21

Object	D2600V2 - SN:1	008	
Calibration procedure(s)	QA CAL-05.v11 Calibration Proc	edure for SAR Validation Source	s between 0.7-3 GHz
Calibration date:	August 17, 2021		
the measurements and the uncer	tainties with confidence p	ional standards, which realize the physical un robability are given on the following pages ar ry facility: environment temperature (22 ± 3)%	nd are part of the certificate.
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	ID # SN: 104778	Cal Date (Certificate No.) 09-Apr-21 (No. 217-03291/03292)	Scheduled Calibration
Power meter NRP		09-Apr-21 (No. 217-03291/03292)	Apr-22
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91	SN: 104778	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291)	Apr-22 Apr-22
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator	SN: 104778 SN: 103244	09-Apr-21 (No. 217-03291/03292)	Apr-22 Apr-22 Apr-22
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination	SN: 104778 SN: 103244 SN: 103245	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292)	Apr-22 Apr-22 Apr-22 Apr-22
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k)	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343)	Apr-22 Apr-22 Apr-22 Apr-22 Apr-22
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344)	Apr-22 Apr-22 Apr-22 Apr-22
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 28-Dec-20 (No. EX3-7349_Dec20) 02-Nov-20 (No. DAE4-601_Nov20)	Apr-22 Apr-22 Apr-22 Apr-22 Apr-22 Dec-21 Nov-21
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 28-Dec-20 (No. EX3-7349_Dec20) 02-Nov-20 (No. DAE4-601_Nov20) Check Date (in house)	Apr-22 Apr-22 Apr-22 Apr-22 Apr-22 Dec-21 Nov-21 Scheduled Check
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 28-Dec-20 (No. EX3-7349_Dec20) 02-Nov-20 (No. DAE4-601_Nov20) Check Date (in house) 30-Oct-14 (in house check Oct-20)	Apr-22 Apr-22 Apr-22 Apr-22 Apr-22 Dec-21 Nov-21 Scheduled Check In house check: Oct-22
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 28-Dec-20 (No. EX3-7349_Dec20) 02-Nov-20 (No. DAE4-601_Nov20) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20)	Apr-22 Apr-22 Apr-22 Apr-22 Apr-22 Dec-21 Nov-21 Scheduled Check In house check: Oct-22 In house check: Oct-22
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 28-Dec-20 (No. EX3-7349_Dec20) 02-Nov-20 (No. DAE4-601_Nov20) 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-22 Apr-22 Apr-22 Apr-22 Dec-21 Nov-21 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: US37292783 SN: MY41092317	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 28-Dec-20 (No. EX3-7349_Dec20) 02-Nov-20 (No. DAE4-601_Nov20) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20)	Apr-22 Apr-22 Apr-22 Apr-22 Apr-22 Dec-21 Nov-21 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
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41092317 SN: 100972 SN: US41080477	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 28-Dec-20 (No. EX3-7349_Dec20) 02-Nov-20 (No. DAE4-601_Nov20) 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)	Apr-22 Apr-22 Apr-22 Apr-22 Apr-22 Dec-21 Nov-21 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
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41092317 SN: 100972 SN: US41080477 Name	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 28-Dec-20 (No. EX3-7349_Dec20) 02-Nov-20 (No. DAE4-601_Nov20) 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) Function	Apr-22 Apr-22 Apr-22 Apr-22 Apr-22 Dec-21 Nov-21 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
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41092317 SN: 100972 SN: US41080477	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 28-Dec-20 (No. EX3-7349_Dec20) 02-Nov-20 (No. DAE4-601_Nov20) 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)	Apr-22 Apr-22 Apr-22 Apr-22 Apr-22 Dec-21 Nov-21 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
Power meter NRP	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41092317 SN: 100972 SN: US41080477 Name	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 28-Dec-20 (No. EX3-7349_Dec20) 02-Nov-20 (No. DAE4-601_Nov20) 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) Function	Apr-22 Apr-22 Apr-22 Apr-22 Apr-22 Dec-21 Nov-21 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 Laboratory of

Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst

C Service suisse d'étalonnage

Servizio svizzero di taratura

S Swiss Calibration Service

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: D2600V2-1008\_Aug21

Accreditation No.: SCS 0108

# **Measurement Conditions**

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

DASY Version	DASY52	VE0 40 4
Extrapolation	Advanced Extrapolation	V52.10.4
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	with Spacer
Frequency	2600 MHz ± 1 MHz	

# Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.4 ± 6 %	2.04 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		2.04 1110/11 ± 6 %

# SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	44.510
SAR for nominal Head TSL parameters	normalized to 1W	14.9 W/kg
		58.0 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSI	condition	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL SAR measured	condition	Vage during in a second
	condition 250 mW input power normalized to 1W	6.56 W/kg

# Appendix (Additional assessments outside the scope of SCS 0108)

# Antenna Parameters with Head TSL

Impedance, transformed to feed point	10.0.0.0.0.0	_
Return Loss	49.2 Ω - 3.0 jΩ	
	- 30.0 dB	

# General Antenna Parameters and Design

Electrical Delay (one direction)	1.153 ns
	1.155 fts

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 according to the Standard. No excessive force must be caption to the antenna is the second are not affected by this change. The overall dipole length is still to be excessive force must be caption 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

# DASY5 Validation Report for Head TSL

Date: 17.08.2021

Test Laboratory: SPEAG, Zurich, Switzerland

# DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1008

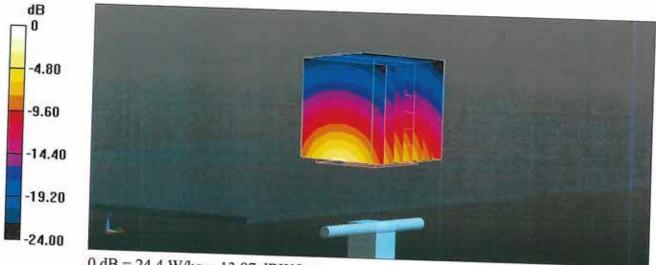
Communication System: UID 0 - CW; Frequency: 2600 MHz Medium parameters used: f = 2600 MHz;  $\sigma$  = 2.04 S/m;  $\epsilon_r$  = 37.4;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(7.84, 7.84, 7.84) @ 2600 MHz; Calibrated: 28.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection) .
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020 •
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001 ٠
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

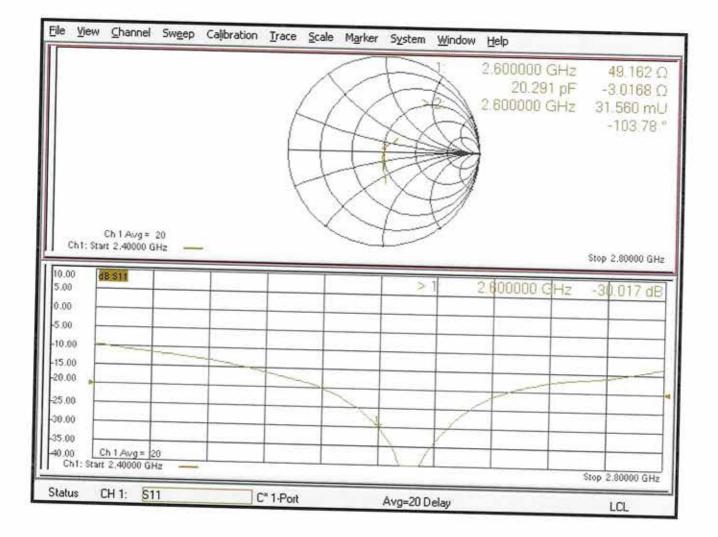
# Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 119.8 V/m; Power Drift = 0.08 dB Peak SAR (extrapolated) = 29.9 W/kg SAR(1 g) = 14.9 W/kg; SAR(10 g) = 6.56 W/kg Smallest distance from peaks to all points 3 dB below = 9 mm Ratio of SAR at M2 to SAR at M1 = 49.9% Maximum value of SAR (measured) = 24.4 W/kg



0 dB = 24.4 W/kg = 13.87 dBW/kg

# Impedance Measurement Plot for Head TSL





### D2600V2, serial no. 1008 Extended Dipole Calibrations

Referring to KDB 450824, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

### <Justification of the extended calibration>

D <b>2600</b> V2 – serial no. <b>1008</b>						
	2600MHZ					
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
08.17.2021	-30.017		49.162		-3.0168	
(Cal. Report)	00.011		10.102		0.0100	
08.16.2022	-25.072	-16.47	46.926	2.236	-5.6571	2.6403
(extended)	-23.072	-10.47	40.920	2.230	-5.0571	2.0403

The return loss is < -20dB, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.



511 Log Mag 10.00dB/ Ref 0.000dB [F1] 50.00 >1 2.6000000 GHz -25.072 dB 20.00 0.000 뷳 IFBW 70 kHz Stop 2.8 GHz Cor 1 Start 2.4 GHz 1 S11 Smith (R+jX) Scale 1.000U [F1 Del] >1 2.6000000 GHz 46.926 Ω -5.6571 Ω 10.821 pF 1 Start 2.4 GHz Stop 2.8 GHz Cor IFBW 70 kHz

<Dipole Verification Data> - D2600 V2, serial no. 1008 (Data of Measurement : 08.16.2022) 2600 MHz - Head

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



Schweizerischer Kalibrierdienst

Service suisse d'étalonnage

С Servizio svizzero di taratura

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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

### Client Sporton

### Certificate No: D2600V2-1078\_Jun22

# **CALIBRATION CERTIFICATE**

	D2600V2 - SN:10	078	
Calibration procedure(s)	QA CAL-05.v11 Calibration Proce	edure for SAR Validation Sources	between 0.7-3 GHz
Calibration date:	June 23, 2022		
The measurements and the uncert	ainties with confidence p	onal standards, which realize the physical uni robability are given on the following pages an ry facility: environment temperature (22 ± 3)°C	d are part of the certificate.
Calibration Equipment used (M&TE	an a		
NAME OF A DECK			
and a second design of the	ID#	Cal Date (Certificate No.)	Scheduled Calibration
ower meter NRP	SN: 104778	04-Apr-22 (No. 217-03525/03524)	Apr-23
ower meter NRP ower sensor NRP-Z91	SN: 104778 SN: 103244	04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524)	Apr-23 Apr-23
ower meter NRP ower sensor NRP-Z91 ower sensor NRP-Z91	SN: 104778 SN: 103244 SN: 103245	04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525)	Apr-23 Apr-23 Apr-23
ower meter NRP ower sensor NRP-Z91 ower sensor NRP-Z91 eference 20 dB Attenuator	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k)	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)	Apr-23 Apr-23
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator ype-N mismatch combination	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327	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)	Apr-23 Apr-23 Apr-23
ower meter NRP ower sensor NRP-Z91 ower sensor NRP-Z91 eference 20 dB Attenuator ype-N mismatch combination eference Probe EX3DV4	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349	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)	Apr-23 Apr-23 Apr-23 Apr-23
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327	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)	Apr-23 Apr-23 Apr-23 Apr-23 Apr-23
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349	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)	Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601	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)	Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Sype-N mismatch combination Reference Probe EX3DV4 DAE4 Recondary Standards Power meter E4419B	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601	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)	Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475	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) Check Date (in house) 30-Oct-14 (in house check Oct-20)	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
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Power sensor HP 8481A Power sensor HP 8481A	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783	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) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20)	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
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: WY41093315	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) 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 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
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 7349 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: 100972	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) 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 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22
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	SN: 104778 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	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) 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) Function	Apr-23 Apr-23 Apr-23 Apr-23 Dec-22 May-23 Scheduled Check In house check: Oct-22 In house check: Oct-22
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:	SN: 104778 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	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) 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)	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



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Accreditation No.: SCS 0108

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### 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%.

### 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	2600 MHz ± 1 MHz	

### **Head TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.8 ± 6 %	2.01 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

### SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.1 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	55.4 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL SAR measured	condition 250 mW input power	6.29 W/kg

### Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.2 Ω - 7.3 jΩ		
Return Loss	- 22.6 dB		

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.153 ns	
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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

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

### Additional EUT Data

Manufactured by	SPEAG
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### **DASY5 Validation Report for Head TSL**

Date: 23.06.2022

Test Laboratory: SPEAG, Zurich, Switzerland

### DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1078

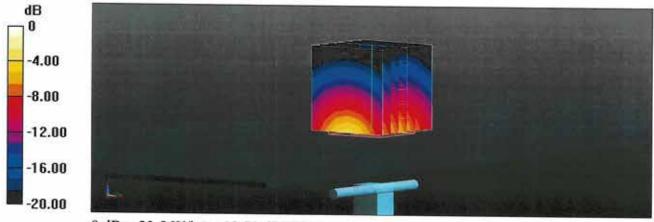
Communication System: UID 0 - CW; Frequency: 2600 MHz Medium parameters used: f = 2600 MHz;  $\sigma$  = 2.01 S/m;  $\epsilon_r$  = 37.8;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

### DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(7.84, 7.84, 7.84) @ 2600 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 = 117.7 V/m; Power Drift = 0.07 dB Peak SAR (extrapolated) = 28.0 W/kg SAR(1 g) = 14.1 W/kg; SAR(10 g) = 6.29 W/kg Smallest distance from peaks to all points 3 dB below = 9 mm Ratio of SAR at M2 to SAR at M1 = 50.5% Maximum value of SAR (measured) = 23.5 W/kg



0 dB = 23.5 W/kg = 13.71 dBW/kg

### Impedance Measurement Plot for Head TSL

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5.0( 0.0) 5.0 10) 15) 20) 25) 30, 35) 40)	) - ) - 0 - 00 - 00 - 00 - 00 - 00 - 00	Ch 1 Avg = nt 2.40000 (	20				~		2.6	00000	GHz	-23	2.644 dE

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



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Client Sporton Certificate No: D3500V2-1014\_Jan22

# CALIBRATION CERTIFICATE

Object	D3500V2 - SN:1	014	
Calibration procedure(s)	QA CAL-22.v6		
	Calibration Proc	edure for SAR Validation Source	s between 3-10 GHz
Calibration date:	January 17, 202	2	
This calibration cortificate docume	ete the transition of the		
The measurements and the uncer	his the traceability to hal	ional standards, which realize the physical ur	nits of measurements (SI).
	and an addition of	probability are given on the following pages a	to are part of the certificate.
All calibrations have been conduct	ed in the closed laborato	ry facility: environment temperature (22 $\pm$ 3)°	0
		$(22 \pm 3)$	C and numidity < 70%.
Calibration Equipment used (M&TI	E critical for calibration)		
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	09-Apr-21 (No. 217-03291/03292)	Apr-22
Power sensor NRP-Z91	SN: 103244	09-Apr-21 (No. 217-03291)	Apr-22 Apr-22
ower sensor NRP-Z91	SN: 103245	09-Apr-21 (No. 217-03292)	Apr-22
Reference 20 dB Attenuator	SN: BH9394 (20k)	09-Apr-21 (No. 217-03343)	Apr-22
ype-N mismatch combination	SN: 310982 / 06327	09-Apr-21 (No. 217-03344)	Apr-22
Reference Probe EX3DV4	SN: 3503	31-Dec-21 (No. EX3-3503_Dec21)	Dec-22
DAE4	SN: 601	01-Nov-21 (No. DAE4-601_Nov21)	Nov-22
econdary Standards	ID #	Check Date (in house)	Scheduled Check
ower meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
ower sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
ower sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
IF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
letwork Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-22
	Name	Function	Signature
alibrated by:	Michael Weber	Laboratory Technician	
			MARX
pproved by:	Sven Kühn	Deputy Manager	
pproved by:	Sven Kühn	Deputy Manager	M. MELT S.C.
pproved by:	Sven Kühn	Deputy Manager	Si Lik Issued: January 20, 2022

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### 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%.

### **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 = 4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	3500 MHz ± 1 MHz	

### Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	37.9	2.91 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.2 ± 6 %	2.91 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	<u> </u>	

### SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.75 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	67.2 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.52 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	25.1 W/kg ± 19.5 % (k=2)

# Appendix (Additional assessments outside the scope of SCS 0108)

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.7 Ω - 4.4 jΩ	
Return Loss	- 24.2 dB	

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.133 ns	
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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

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

### Additional EUT Data

SPEAG	
_	SPEAG

### **DASY5 Validation Report for Head TSL**

Date: 17.01.2022

Test Laboratory: SPEAG, Zurich, Switzerland

### DUT: Dipole 3500 MHz; Type: D3500V2; Serial: D3500V2 - SN:1014

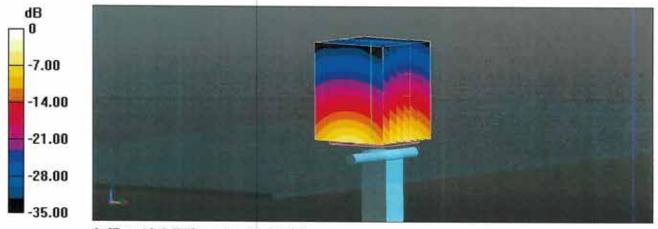
Communication System: UID 0 - CW; Frequency: 3500 MHz Medium parameters used: f = 3500 MHz;  $\sigma = 2.91$  S/m;  $\epsilon_r = 37.2$ ;  $\rho = 1000$  kg/m<sup>3</sup> Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN3503; ConvF(7.91, 7.91, 7.91) @ 3500 MHz; Calibrated: 31.12.2021
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 01.11.2021
- 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=100 mW, d=10mm, f=3500MHz/Zoom Scan,

dist=1.4mm (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 69.66 V/m; Power Drift = 0.09 dB Peak SAR (extrapolated) = 18.5 W/kg SAR(1 g) = 6.75 W/kg; SAR(10 g) = 2.52 W/kg Smallest distance from peaks to all points 3 dB below = 8.4 mm Ratio of SAR at M2 to SAR at M1 = 74.5% Maximum value of SAR (measured) = 13.0 W/kg



0 dB = 13.0 W/kg = 11.12 dBW/kg

# Impedance Measurement Plot for Head TSL

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5.0	.00										-		
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Client Sporton

Certificate No: D3500V2-1036 Mar22

# CALIBRATION CERTIFICATE

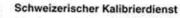
Object	D3500V2 - SN:1	036	
Calibration procedure(s)	QA CAL-22.v6 Calibration Proce	edure for SAR Validation Sources	s between 3-10 GHz
Calibration date:	March 23, 2022		
The measurements and the uncert	ainties with confidence p ed in the closed laborato	ional standards, which realize the physical un probability are given on the following pages ar ry facility: environment temperature ( $22 \pm 3$ )°(	nd are part of the certificate.
	n en	Cal Data (Cartificata No.)	
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
the state of the s	SN: 104778	Cal Date (Certificate No.) 09-Apr-21 (No. 217-03291/03292)	Scheduled Calibration Apr-22
Power meter NRP Power sensor NRP-Z91			
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91	SN: 104778	09-Apr-21 (No. 217-03291/03292)	Apr-22
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator	SN: 104778 SN: 103244	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291)	Apr-22 Apr-22
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344)	Apr-22 Apr-22 Apr-22
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Fype-N mismatch combination Reference Probe EX3DV4	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343)	Apr-22 Apr-22 Apr-22 Apr-22
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Fype-N mismatch combination Reference Probe EX3DV4	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344)	Apr-22 Apr-22 Apr-22 Apr-22 Apr-22
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 08-Mar-22 (No. EX3-3503_Mar22)	Apr-22 Apr-22 Apr-22 Apr-22 Apr-22 Mar-23
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 08-Mar-22 (No. EX3-3503_Mar22) 01-Nov-21 (No. DAE4-601_Nov21)	Apr-22 Apr-22 Apr-22 Apr-22 Apr-22 Mar-23 Nov-22 Scheduled Check
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 08-Mar-22 (No. EX3-3503_Mar22) 01-Nov-21 (No. DAE4-601_Nov21) Check Date (in house)	Apr-22 Apr-22 Apr-22 Apr-22 Apr-22 Mar-23 Nov-22
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601 ID # SN: GB39512475	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 08-Mar-22 (No. EX3-3503_Mar22) 01-Nov-21 (No. DAE4-601_Nov21) Check Date (in house) 30-Oct-14 (in house check Oct-20)	Apr-22 Apr-22 Apr-22 Apr-22 Apr-22 Mar-23 Nov-22 Scheduled Check In house check: Oct-22
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601 ID # SN: GB39512475 SN: US37292783	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 08-Mar-22 (No. EX3-3503_Mar22) 01-Nov-21 (No. DAE4-601_Nov21) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20)	Apr-22 Apr-22 Apr-22 Apr-22 Apr-22 Mar-23 Nov-22 Scheduled Check In house check: Oct-22 In house check: Oct-22
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: WY41093315	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 08-Mar-22 (No. 217-03344) 08-Mar-22 (No. EX3-3503_Mar22) 01-Nov-21 (No. DAE4-601_Nov21) 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-22 Apr-22 Apr-22 Apr-22 Apr-22 Mar-23 Nov-22 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: 100972	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 08-Mar-22 (No. EX3-3503_Mar22) 01-Nov-21 (No. DAE4-601_Nov21) 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-22 Apr-22 Apr-22 Apr-22 Apr-22 Mar-23 Nov-22 Scheduled Check In house check: Oct-22 In house check: Oct-22
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: 100972 SN: US41080477	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 08-Mar-22 (No. EX3-3503_Mar22) 01-Nov-21 (No. DAE4-601_Nov21) 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)	Apr-22 Apr-22 Apr-22 Apr-22 Apr-22 Mar-23 Nov-22 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 Laboratory of Schmid & Partner

Glossary

Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland





- s Service suisse d'étalonnage
- C Servizio svizzero di taratura
- S Swiss Calibration Service

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

Accreditation No.: SCS 0108

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%.

### **Measurement Conditions**

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	TOL: TOL: TOL: TOL: TOL: TOL: TOL: TOL:
Phantom	Modular Flat Phantom	7
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	3500 MHz ± 1 MHz	

## **Head TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	37.9	2.91 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.4 ± 6 %	2.94 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

#### SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.78 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	67.4 W/kg ± 19.9 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL SAR measured	condition 100 mW input power	2.52 W/kg

## Appendix (Additional assessments outside the scope of SCS 0108)

#### Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.3 Ω - 1.8 jΩ	
Return Loss	- 30.9 dB	

### **General Antenna Parameters and Design**

Electrical Delay (one direction)	1.140 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	
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## DASY5 Validation Report for Head TSL

Date: 23.03.2022

Test Laboratory: SPEAG, Zurich, Switzerland

#### DUT: Dipole 3500 MHz; Type: D3500V2; Serial: D3500V2 - SN:1036

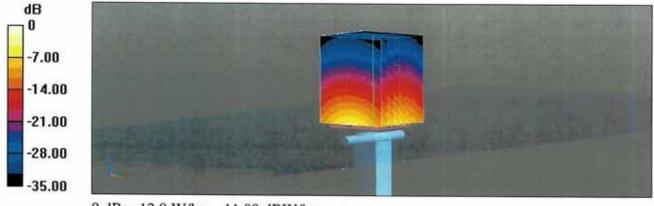
Communication System: UID 0 - CW; Frequency: 3500 MHz Medium parameters used: f = 3500 MHz;  $\sigma = 2.94$  S/m;  $\epsilon_r = 37.4$ ;  $\rho = 1000$  kg/m<sup>3</sup> Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN3503; ConvF(7.91, 7.91, 7.91) @ 3500 MHz; Calibrated: 08.03.2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 01.11.2021
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

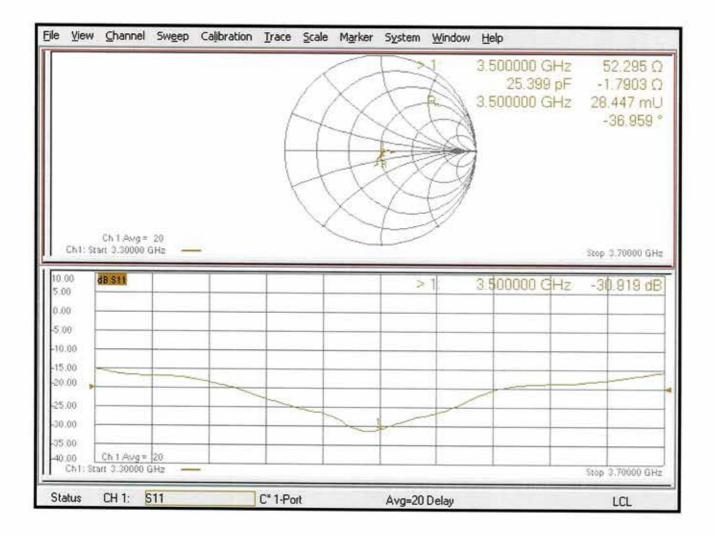
## Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm, f=3500MHz/Zoom Scan,

dist=1.4mm (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 72.91 V/m; Power Drift = 0.06 dB Peak SAR (extrapolated) = 18.5 W/kg SAR(1 g) = 6.78 W/kg; SAR(10 g) = 2.52 W/kg Smallest distance from peaks to all points 3 dB below = 8 mm Ratio of SAR at M2 to SAR at M1 = 74.5% Maximum value of SAR (measured) = 12.9 W/kg



0 dB = 12.9 W/kg = 11.09 dBW/kg

## Impedance Measurement Plot for Head TSL



Sporton

Client



Schweizerischer Kalibrierdienst

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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

#### Certificate No: D3700V2-1006\_Jun22

# CALIBRATION CERTIFICATE

Object	D3700V2 - SN:10	006	and the Party of the
Calibration procedure(s)	QA CAL-22.v6 Calibration Proce	dure for SAR Validation Sources	between 3-10 GHz
Calibration date:	June 20, 2022		
		onal standards, which realize the physical uni	
		obability are given on the following pages an	
All calibrations have been conducte	ed in the closed laborator	y facility: environment temperature (22 ± 3)°C	C and humidity < 70%.
Calibration Equipment used (M&TE	critical for calibration)		
rimary Standards	ID#	Cal Date (Certificate No.)	Seheduled Coliberation
	ID #	Cal Date (Certificate No.)	Scheduled Calibration
ower meter NRP	SN: 104778	04-Apr-22 (No. 217-03525/03524)	Apr-23
ower meter NRP ower sensor NRP-Z91	SN: 104778 SN: 103244	04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524)	Apr-23 Apr-23
ower meter NRP ower sensor NRP-Z91 ower sensor NRP-Z91	SN: 104778 SN: 103244 SN: 103245	04-Apr-22 (No. 217-03525/03524) 04-Apr-22 (No. 217-03524) 04-Apr-22 (No. 217-03525)	Apr-23 Apr-23 Apr-23
ower meter NRP ower sensor NRP-Z91 ower sensor NRP-Z91 eference 20 dB Attenuator	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k)	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)	Apr-23 Apr-23 Apr-23 Apr-23
ower meter NRP ower sensor NRP-Z91 ower sensor NRP-Z91 leference 20 dB Attenuator ype-N mismatch combination	SN: 104778 SN: 103244 SN: 103245	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)	Apr-23 Apr-23 Apr-23 Apr-23 Apr-23
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327	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)	Apr-23 Apr-23 Apr-23 Apr-23
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503	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) 08-Mar-22 (No. EX3-3503_Mar22) 02-May-22 (No. DAE4-601_May22)	Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Mar-23
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601	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) 08-Mar-22 (No. EX3-3503_Mar22)	Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Mar-23 May-23 Scheduled Check
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601	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) 08-Mar-22 (No. EX3-3503_Mar22) 02-May-22 (No. DAE4-601_May22) Check Date (in house)	Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Mar-23 Mar-23 May-23 Scheduled Check In house check: Oct-22
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601 ID # SN: GB39512475	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) 08-Mar-22 (No. EX3-3503_Mar22) 02-May-22 (No. DAE4-601_May22) Check Date (in house) 30-Oct-14 (in house check Oct-20)	Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Mar-23 May-23
Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Becondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601 ID # SN: GB39512475 SN: US37292783	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) 08-Mar-22 (No. 217-03528) 07-Oct-14 (in house check Oct-20)	Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Mar-23 Mar-23 Scheduled Check In house check: Oct-22 In house check: Oct-22
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315	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) 08-Mar-22 (No. EX3-3503_Mar22) 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 Apr-23 Apr-23 Apr-23 Mar-23 Mar-23 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: 100972	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) 08-Mar-22 (No. EX3-3503_Mar22) 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 Apr-23 Apr-23 Apr-23 Mar-23 Mar-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
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	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: 100972 SN: US41080477	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) 08-Mar-22 (No. EX3-3503_Mar22) 02-May-22 (No. DAE4-601_May22) 02-May-22 (No. DAE4-601_May22) 03-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 07-Oct-15 (in house check Oct-20) 031-Mar-14 (in house check Oct-20)	Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Mar-23 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
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:	SN: 104778 SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: 100972 SN: US41080477 Name	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) 08-Mar-22 (No. EX3-3503_Mar22) 02-May-22 (No. DAE4-601_May22) 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) Function	Apr-23 Apr-23 Apr-23 Apr-23 Apr-23 Mar-23 Mar-23 Scheduled Check In house check: Oct-22 In house check: Oct-22



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- С Servizio svizzero di taratura
- S Swiss Calibration Service

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:

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ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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- 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"

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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.
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- 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.
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- 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: D3700V2-1006\_Jun22

Accreditation No.: SCS 0108

### 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 = 4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	3700 MHz ± 1 MHz	

## **Head TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	37.7	3.12 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.0 ± 6 %	3.07 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	1040	

#### SAR result with Head TSL

	SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
	SAR measured	100 mW input power	6.56 W/kg
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL condition	SAR for nominal Head TSL parameters	normalized to 1W	65.6 W/kg ± 19.9 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL condition	SAD		
	SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	

(10 3) 011000 101	oonandon	
SAR measured	100 mW input power	2.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.7 W/kg ± 19.5 % (k=2)

## Appendix (Additional assessments outside the scope of SCS 0108)

#### Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.6 Ω - 10.0 jΩ	
Return Loss	- 20.0 dB	

### **General Antenna Parameters and Design**

Electrical Delay (one direction)	1.137 ns	
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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

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

## Additional EUT Data

Manufactured by	SPEAG
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## **DASY5 Validation Report for Head TSL**

Date: 20.06.2022

Test Laboratory: SPEAG, Zurich, Switzerland

#### DUT: Dipole 3700 MHz; Type: D3700V2; Serial: D3700V2 - SN:1006

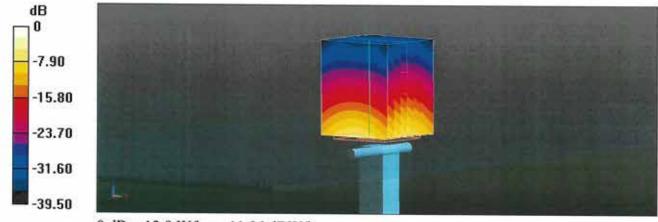
Communication System: UID 0 - CW; Frequency: 3700 MHz Medium parameters used: f = 3700 MHz;  $\sigma = 3.07$  S/m;  $\epsilon_r = 37$ ;  $\rho = 1000$  kg/m<sup>3</sup> Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN3503; ConvF(7.73, 7.73, 7.73) @ 3700 MHz; Calibrated: 08.03.2022
- 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=100 mW, d=10mm, f=3700MHz/Zoom Scan,

dist=1.4mm (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 68.96 V/m; Power Drift = -0.01 dB Peak SAR (extrapolated) = 18.6 W/kg SAR(1 g) = 6.56 W/kg; SAR(10 g) = 2.38 W/kg Smallest distance from peaks to all points 3 dB below = 8 mm Ratio of SAR at M2 to SAR at M1 = 73.4% Maximum value of SAR (measured) = 12.8 W/kg



0 dB = 12.8 W/kg = 11.06 dBW/kg

# Impedance Measurement Plot for Head TSL

				4	X	Æ	A	3.700000 4.283 3.700000	2 pF	-10. 99.50	626 C 043 C 01 mL 1.734 1
				E	J	X	Ì				
		- 20		23	$\bigvee$	-	Y				
Ch1: 0.00 5.00	Ch 1 Avg = Start 3.50000	GHz -	-				1	3.700000	GHz	Stop 3.9	
0.00 5.00 0.00 5.00 10.00 15.00	Start 3.50000	GHz -						3.700000	GHz		
0.00	Start 3.50000	GHz						3.700000	GHz		43 dB

Sporton

Client



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Service suisse d'étalonnage

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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

Certificate No: D3700V2-1022 Jul21

# **CALIBRATION CERTIFICATE**

Dbject	D3700V2 - SN:10	022	
Calibration procedure(s)	QA CAL-22.v6 Calibration Proce	edure for SAR Validation Sources	between 3-10 GHz
Calibration date:	July 14, 2021		
The measurements and the uncert	ainties with confidence p ad in the closed laborato	ional standards, which realize the physical un robability are given on the following pages an ry facility: environment temperature ( $22 \pm 3$ )°(	d are part of the certificate.
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
	SN: 104778	09-Apr-21 (No. 217-03291/03292)	Apr-22
ower sensor NRP-Z91	SN: 103244	09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291)	Apr-22 Apr-22
wer sensor NRP-Z91 wer sensor NRP-Z91	SN: 103244 SN: 103245		C 2012 C 2012 C
ower sensor NRP-Z91 ower sensor NRP-Z91 eference 20 dB Attenuator	SN: 103244 SN: 103245 SN: BH9394 (20k)	09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343)	Apr-22
ower sensor NRP-Z91 ower sensor NRP-Z91 eference 20 dB Attenuator pe-N mismatch combination	SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327	09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292)	Apr-22 Apr-22
ower sensor NRP-Z91 ower sensor NRP-Z91 eference 20 dB Attenuator /pe-N mismatch combination eference Probe EX3DV4	SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503	09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 30-Dec-20 (No. EX3-3503_Dec20)	Apr-22 Apr-22 Apr-22
ower sensor NRP-Z91 ower sensor NRP-Z91 eference 20 dB Attenuator ype-N mismatch combination eference Probe EX3DV4	SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327	09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344)	Apr-22 Apr-22 Apr-22 Apr-22 Apr-22
Yower sensor NRP-Z91 Yower sensor NRP-Z91 Reference 20 dB Attenuator Ype-N mismatch combination Reference Probe EX3DV4 PAE4	SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601	09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 30-Dec-20 (No. EX3-3503_Dec20)	Apr-22 Apr-22 Apr-22 Apr-22 Dec-21
ower sensor NRP-Z91 ower sensor NRP-Z91 leference 20 dB Attenuator ype-N mismatch combination leference Probe EX3DV4 AE4 econdary Standards ower meter E4419B	SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601	09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 30-Dec-20 (No. EX3-3503_Dec20) 02-Nov-20 (No. DAE4-601_Nov20)	Apr-22 Apr-22 Apr-22 Apr-22 Dec-21 Nov-21
ower sensor NRP-Z91 ower sensor NRP-Z91 eference 20 dB Attenuator ype-N mismatch combination eference Probe EX3DV4 AE4 econdary Standards ower meter E4419B ower sensor HP 8481A	SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601	09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 30-Dec-20 (No. EX3-3503_Dec20) 02-Nov-20 (No. DAE4-601_Nov20) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20)	Apr-22 Apr-22 Apr-22 Apr-22 Dec-21 Nov-21 Scheduled Check
Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Pype-N mismatch combination Reference Probe EX3DV4 PAE4 Recondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A	SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601 ID # SN: GB39512475	09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 30-Dec-20 (No. EX3-3503_Dec20) 02-Nov-20 (No. DAE4-601_Nov20) Check Date (in house) 30-Oct-14 (in house check Oct-20)	Apr-22 Apr-22 Apr-22 Apr-22 Dec-21 Nov-21 Scheduled Check In house check: Oct-22
ower sensor NRP-Z91 ower sensor NRP-Z91 eference 20 dB Attenuator ype-N mismatch combination eference Probe EX3DV4 AE4 econdary Standards ower meter E4419B ower sensor HP 8481A ower sensor HP 8481A F generator R&S SMT-06	SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41092317 SN: 100972	09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 30-Dec-20 (No. EX3-3503_Dec20) 02-Nov-20 (No. DAE4-601_Nov20) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20)	Apr-22 Apr-22 Apr-22 Apr-22 Dec-21 Nov-21 Scheduled Check In house check: Oct-22 In house check: Oct-22
ower sensor NRP-Z91 ower sensor NRP-Z91 eference 20 dB Attenuator ype-N mismatch combination eference Probe EX3DV4 AE4 econdary Standards ower meter E4419B ower sensor HP 8481A ower sensor HP 8481A F generator R&S SMT-06	SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41092317	09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 30-Dec-20 (No. 217-0344) 30-Dec-20 (No. 217-0344) 30-Oct-14 (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20)	Apr-22 Apr-22 Apr-22 Dec-21 Nov-21 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
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	SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41092317 SN: 100972	09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 30-Dec-20 (No. EX3-3503_Dec20) 02-Nov-20 (No. DAE4-601_Nov20) 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-22 Apr-22 Apr-22 Dec-21 Nov-21 Scheduled Check In house check: Oct-22 In house check: Oct-21
Power sensor NRP-Z91 Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Recondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A Reference R&S SMT-06 Network Analyzer Agilent E8358A	SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41092317 SN: 100972 SN: US41080477	09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 30-Dec-20 (No. 217-03344) 30-Dec-20 (No. EX3-3503_Dec20) 02-Nov-20 (No. DAE4-601_Nov20) 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)	Apr-22 Apr-22 Apr-22 Dec-21 Nov-21 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
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 Power sensor HP 8481A RF generator R&S SMT-06 Network Analyzer Agilent E8358A Calibrated by:	SN: 103244 SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41092317 SN: 100972 SN: US41080477 Name	09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 30-Dec-20 (No. 217-03344) 30-Dec-20 (No. 217-03344) 30-Dec-20 (No. 217-03344) 02-Nov-20 (No. DAE4-601_Nov20) 02-Nov-20 (No. DAE4-601_Nov20) 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) Function	Apr-22 Apr-22 Apr-22 Dec-21 Nov-21 Scheduled Check In house check: Oct-22 In house check: Oct-21

Calibration Laboratory of Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland



Schweizerischer Kalibrierdienst

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- S Swiss Calibration Service

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#### 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.
- 0 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%.

Accreditation No.: SCS 0108

## 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 = 4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	3700 MHz ± 1 MHz	

## Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	37.7	3.12 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.7 ± 6 %	3.12 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	1 - MAR - 1	3444

## SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.82 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	68.2 W/kg ± 19.9 % (k=2)
	72.67	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	

\$AR measured	100 mW input power	2.47 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.7 W/kg ± 19.5 % (k=2)

## Appendix (Additional assessments outside the scope of SCS 0108)

## Antenna Parameters with Head TSL

mpedance, transformed to feed point	51.2 Ω - 4.0 jΩ	
Return Loss	- 27.7 dB	

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.125 ns	
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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

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

## Additional EUT Data

Manufactured by	SPEAG

## **DASY5** Validation Report for Head TSL

Date: 14.07.2021

Test Laboratory: SPEAG, Zurich, Switzerland

### DUT: Dipole 3700 MHz; Type: D3700V2; Serial: D3700V2 - SN:1022

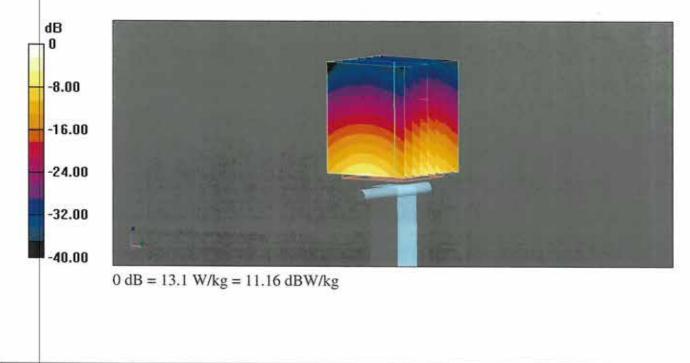
Communication System: UID 0 - CW; Frequency: 3700 MHz Medium parameters used: f = 3700 MHz;  $\sigma = 3.12$  S/m;  $\epsilon_r = 37.7$ ;  $\rho = 1000$  kg/m<sup>3</sup> Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

### DASY52 Configuration:

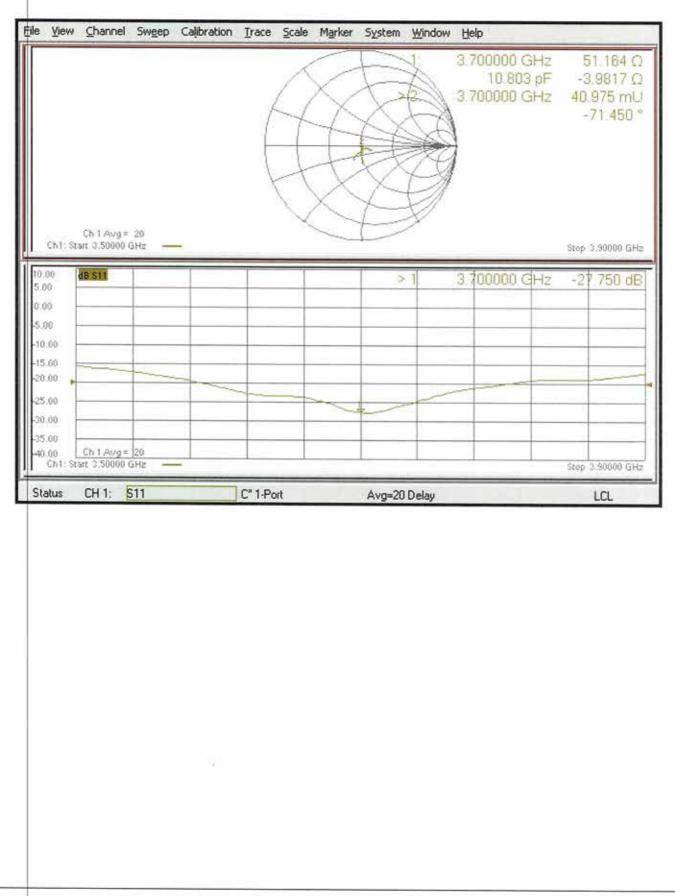
- Probe: EX3DV4 SN3503; ConvF(7.73, 7.73, 7.73) @ 3700 MHz; Calibrated: 30.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.11.2020
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

# Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm, f=3700MHz/Zoom Scan,

dist=1.4mm (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 72.98 V/m; Power Drift = -0.08 dB Peak \$AR (extrapolated) = 19.2 W/kg SAR(1 g) = 6.82 W/kg; SAR(10 g) = 2.47 W/kg Smallest distance from peaks to all points 3 dB below = 8 mm Ratio of SAR at M2 to SAR at M1 = 72.8% Maximum value of SAR (measured) = 13.1 W/kg



## Impedance Measurement Plot for Head TSL





## D3700V2, serial no. 1022 Extended Dipole Calibrations

Referring to KDB 450824, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

#### <Justification of the extended calibration>

			D <b>3700</b> V2 – serial no. <b>1</b> 0	022		
			370	0MHZ		
Date of Measurement	Return-Loss (dB)	Delta (%)	Real Impedance (ohm)	Delta (ohm)	Imaginary Impedance (ohm)	Delta (ohm)
07.14.2021 (Cal. Report)	-27.75		51.164		-3.9817	
07.13.2022 (extended)	-24.914	10.21	54.098	-2.934	-5.305	1.3233

The return loss is < -20dB, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration. Therefore the verification result should support extended calibration.



r1 S11 Log Mag 10.00dB/ Ref 0.000dB [F1] 3.7000000 GHz -24.914 dB >1 0.000 -30.00 1 Start 3.5 GHz IFBW 70 kHz Stop 3.9 GHz Cor 1 S11 Smith (R+jX) Scale 1.000U [F1 Del] >1 3.7000000 GHz 54.098 Ω -5.3050 Ω 8.1083 pF 1 Start 3.5 GHz IFBW 70 kHz Stop 3.9 GHz Cor

<Dipole Verification Data> - D3700 V2, serial no. 1022 (Data of Measurement : 07.13.2022) 3700 MHz - Head



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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

Client Sporton Certificate No: D3900V2-1017\_Apr22

# **CALIBRATION CERTIFICATE**

55	D3900V2 - SN:10	017	
Calibration procedure(s)	QA CAL-22.v6 Calibration Proce	edure for SAR Validation Sources	between 3-10 GHz
Calibration date:	April 22, 2022		
This calibration certificate documen The measurements and the uncerta	its the traceability to nati- ainties with confidence p	onal standards, which realize the physical uni robability are given on the following pages an	ts of measurements (SI). d are part of the certificate.
All calibrations have been conducte	d in the closed laborator	ry facility: environment temperature $(22 \pm 3)^{\circ}$ C	and humidity < 70%,
Calibration Equipment used (M&TE	critical for calibration)		
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-22 (No. 217-03525/03524)	Apr-23
Power sensor NRP-Z91	SN: 103244	04-Apr-22 (No. 217-03524)	Apr-23
one sensor MICF-291		( · · · · · · · · · · · · · ·	
	SN: 103245		A Construction of the Cons
Power sensor NRP-Z91	1999 - 1990 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -	04-Apr-22 (No. 217-03525)	Apr-23
Power sensor NRP-Z91 Reference 20 dB Attenuator	SN: 103245	04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527)	A Construction of the Cons
Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination	SN: 103245 SN: BH9394 (20k)	04-Apr-22 (No. 217-03525)	Apr-23 Apr-23
Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4	SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327	04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528)	Apr-23 Apr-23 Apr-23
Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards	SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503	04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 08-Mar-22 (No. EX3-3503_Mar22)	Apr-23 Apr-23 Apr-23 Mar-23
Power sensor NRP-Z91 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards Power meter E4419B	SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601	04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 08-Mar-22 (No. EX3-3503_Mar22) 01-Nov-21 (No. DAE4-601_Nov21)	Apr-23 Apr-23 Apr-23 Mar-23 Nov-22
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	SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601	04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 08-Mar-22 (No. EX3-3503_Mar22) 01-Nov-21 (No. DAE4-601_Nov21) Check Date (in house) 30-Oct-14 (in house check Oct-20) 07-Oct-15 (in house check Oct-20)	Apr-23 Apr-23 Apr-23 Mar-23 Nov-22 Scheduled Check
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	SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601 ID # SN: GB39512475	04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 08-Mar-22 (No. 217-03528) 08-Mar-22 (No. EX3-3503_Mar22) 01-Nov-21 (No. DAE4-601_Nov21) Check Date (in house) 30-Oct-14 (in house check Oct-20)	Apr-23 Apr-23 Apr-23 Mar-23 Nov-22 Scheduled Check In house check: Oct-22
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	SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: 100972	04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 08-Mar-22 (No. EX3-3503_Mar22) 01-Nov-21 (No. DAE4-601_Nov21) 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 Apr-23 Mar-23 Nov-22 Scheduled Check In house check: Oct-22 In house check: Oct-22
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	SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315	04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 08-Mar-22 (No. EX3-3503_Mar22) 01-Nov-21 (No. DAE4-601_Nov21) 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 Apr-23 Mar-23 Nov-22 Scheduled Check In house check: Oct-22 In house check: Oct-22 In house check: Oct-22
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	SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: 100972 SN: US41080477 Name	04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 08-Mar-22 (No. EX3-3503_Mar22) 01-Nov-21 (No. DAE4-601_Nov21) 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) Function	Apr-23 Apr-23 Apr-23 Mar-23 Nov-22 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
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:	SN: 103245 SN: BH9394 (20k) SN: 310982 / 06327 SN: 3503 SN: 601 ID # SN: GB39512475 SN: US37292783 SN: MY41093315 SN: 100972 SN: US41080477	04-Apr-22 (No. 217-03525) 04-Apr-22 (No. 217-03527) 04-Apr-22 (No. 217-03528) 08-Mar-22 (No. EX3-3503_Mar22) 01-Nov-21 (No. DAE4-601_Nov21) 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)	Apr-23 Apr-23 Apr-23 Mar-23 Nov-22 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