



## Calibration Laboratory of Schmid & Partner





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

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

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

and booking i	
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) 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	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	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	38.5 ± 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	13.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	52.5 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	6.17 W/kg

#### **Body TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.4 ± 6 %	2.02 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

## SAR result with Body TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.4 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	52.4 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL SAR measured	condition 250 mW input power	6.22 W/kg

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

#### Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.6 Ω + 4.9 jΩ	
Return Loss	- 23.9 dB	

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.9 Ω + 5.6 jΩ	
Return Loss	- 25.0 dB	

## General Antenna Parameters and Design

Electrical Delay (one direction) 1.162 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
	SILAU

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

Date: 21.07.2020

Test Laboratory: SPEAG, Zurich, Switzerland

### DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:853

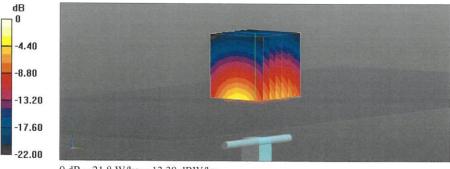
Communication System: UID 0 - CW; Frequency: 2450 MHz Medium parameters used: f = 2450 MHz;  $\sigma$  = 1.84 S/m;  $\varepsilon_r$  = 38.5;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(7.74, 7.74, 7.74) @ 2450 MHz; Calibrated: 29.06.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.12.2019
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 118.2 V/m; Power Drift = -0.05 dB Peak SAR (extrapolated) = 26.2 W/kg **SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.17 W/kg** Smallest distance from peaks to all points 3 dB below = 9 mm Ratio of SAR at M2 to SAR at M1 = 51.1% Maximum value of SAR (measured) = 21.8 W/kg



0 dB = 21.8 W/kg = 13.38 dBW/kg

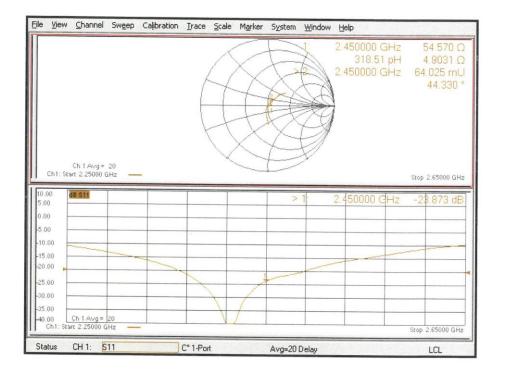
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## Impedance Measurement Plot for Head TSL



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## **DASY5 Validation Report for Body TSL**

Date: 21.07.2020

Test Laboratory: SPEAG, Zurich, Switzerland

### DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:853

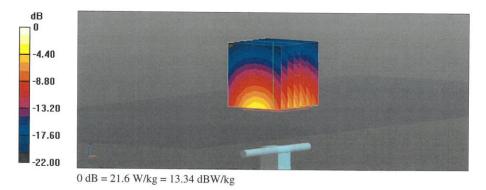
Communication System: UID 0 - CW; Frequency: 2450 MHz Medium parameters used: f = 2450 MHz;  $\sigma$  = 2.02 S/m;  $\epsilon_r$  = 51.4;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(7.82, 7.82, 7.82) @ 2450 MHz; Calibrated: 29.06.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.12.2019
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 111.1 V/m; Power Drift = -0.09 dB Peak SAR (extrapolated) = 25.7 W/kg SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.22 W/kg Smallest distance from peaks to all points 3 dB below = 9 mm Ratio of SAR at M2 to SAR at M1 = 52.9% Maximum value of SAR (measured) = 21.6 W/kg



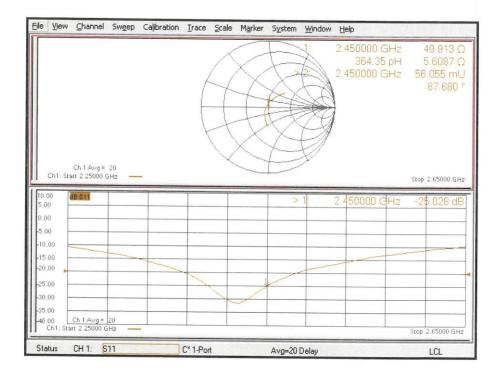
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## Impedance Measurement Plot for Body TSL



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## 2600 MHz Dipole Calibration Certificate

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



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

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Client CTTL-BJ (Auden)

Certificate No: D2600V2-1012\_Jul20

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Object	D2600V2 - SN:	1012	
Calibration procedure(s)	QA CAL-05.v11 Calibration Proc	edure for SAR Validation Source	es between 0.7-3 GHz
Calibration date:	July 21, 2020		
	ted in the closed laborato	tional standards, which realize the physical u probability are given on the following pages a pry facility: environment temperature $(22 \pm 3)$	and are part of the certificate.
Primary Standards	ID #	Cal Date (Certificate No.)	
Power meter NRP	SN: 104778	01-Apr-20 (No. 217-03100/03101)	Scheduled Calibration
ower sensor NRP-Z91	SN: 103244	01-Apr-20 (No. 217-03100/03101)	Apr-21
ower sensor NRP-Z91	SN: 103245	01-Apr-20 (No. 217-03100)	Apr-21
eference 20 dB Attenuator	SN: BH9394 (20k)	31-Mar-20 (No. 217-03106)	Apr-21
pe-N mismatch combination	SN: 310982 / 06327	31-Mar-20 (No. 217-03106)	Apr-21
eference Probe EX3DV4	SN: 7349	29-Jun-20 (No. EX3-7349_Jun20)	Apr-21
AE4	SN: 601	27-Dec-19 (No. DAE4-601_Dec19)	Jun-21 Dec-20
	1.5.	Check Date (in house)	Scheduled Check
econdary Standards	ID #		
ower meter E4419B	ID # SN: GB39512475	Check Date (in house) 30-Oct-14 (in house check Eeb-19)	
ower meter E4419B ower sensor HP 8481A	1.22 11	30-Oct-14 (in house check Feb-19)	In house check: Oct-20
ower meter E4419B ower sensor HP 8481A ower sensor HP 8481A	SN: GB39512475	30-Oct-14 (in house check Feb-19) 07-Oct-15 (in house check Oct-18)	In house check: Oct-20 In house check: Oct-20
ower meter E4419B ower sensor HP 8481A ower sensor HP 8481A F generator R&S SMT-06	SN: GB39512475 SN: US37292783	30-Oct-14 (in house check Feb-19) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18)	In house check: Oct-20 In house check: Oct-20 In house check: Oct-20
ower meter E4419B ower sensor HP 8481A ower sensor HP 8481A F generator R&S SMT-06	SN: GB39512475 SN: US37292783 SN: MY41092317	30-Oct-14 (in house check Feb-19) 07-Oct-15 (in house check Oct-18)	In house check: Oct-20 In house check: Oct-20
ower meter E4419B ower sensor HP 8481A ower sensor HP 8481A F generator R&S SMT-06 etwork Analyzer Agilent E8358A	SN: GB39512475 SN: US37292783 SN: MY41092317 SN: 100972	30-Oct-14 (in house check Feb-19) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18) 15-Jun-15 (in house check Oct-18)	In house check: Oct-20 In house check: Oct-20 In house check: Oct-20 In house check: Oct-20 In house check: Oct-20
ower meter E4419B ower sensor HP 8481A ower sensor HP 8481A F generator R&S SMT-06 letwork Analyzer Agilent E8358A	SN: GB39512475 SN: US37292783 SN: MY41092317 SN: 100972 SN: US41080477	30-Oct-14 (in house check Feb-19) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18) 15-Jun-15 (in house check Oct-18) 31-Mar-14 (in house check Oct-19)	In house check: Oct-20 In house check: Oct-20 In house check: Oct-20 In house check: Oct-20 In house check: Oct-20 Signature
ower meter E4419B ower sensor HP 8481A ower sensor HP 8481A iF generator R&S SMT-06 letwork Analyzer Agilent E8358A alibrated by:	SN: GB39512475 SN: US37292783 SN: MY41092317 SN: 100972 SN: US41080477 Name Jeffrey Katzman	30-Oct-14 (in house check Feb-19) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18) 15-Jun-15 (in house check Oct-18) 31-Mar-14 (in house check Oct-19) Function Laboratory Technician	In house check: Oct-20 In house check: Oct-20 In house check: Oct-20 In house check: Oct-20 In house check: Oct-20 Signature
Recondary Standards Power meter E4419B Power sensor HP 8481A Power sensor HP 8481A IF generator R&S SMT-06 letwork Analyzer Agilent E8358A alibrated by:	SN: GB39512475 SN: US37292783 SN: MY41092317 SN: 100972 SN: US41080477 Name	30-Oct-14 (in house check Feb-19) 07-Oct-15 (in house check Oct-18) 07-Oct-15 (in house check Oct-18) 15-Jun-15 (in house check Oct-18) 31-Mar-14 (in house check Oct-19) Function	In house check: Oct-20 In house check: Oct-20 In house check: Oct-20 In house check: Oct-20 In house check: Oct-20





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



- Schweizerischer Kalibrierdienst Service suisse d'étalonnage С Servizio svizzero di taratura
- 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
N/A	not applicable or not measured

# Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for 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%.

Certificate No: D2600V2-1012\_Jul20

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#### **Measurement Conditions**

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

DASY Version	DASY5	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	37.9 ± 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	14.5 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	57.0 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	6.40 W/kg

## Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.5	2.16 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.0 ± 6 %	2.20 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

## SAR result with Body TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	14.0 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	55.1 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL SAR measured	condition 250 mW input power	6.20 W/kg

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

## Antenna Parameters with Head TSL

Impedance, transformed to feed point	47.0 Ω - 5.6 ίΩ
Return Loss	- 23.7 dB

## Antenna Parameters with Body TSL

Impedance, transformed to feed point	44.6 Ω - 4.4 jΩ
Return Loss	- 22.7 dB

## General Antenna Parameters and Design

Electrical Delay (one direction)	1.152 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**

Manufacture	
Manufactured by	SPEAC
	SPEAG

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## DASY5 Validation Report for Head TSL

Date: 21.07.2020

Test Laboratory: SPEAG, Zurich, Switzerland

## DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1012

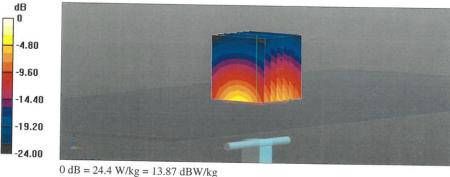
Communication System: UID 0 - CW; Frequency: 2600 MHz Medium parameters used: f = 2600 MHz;  $\sigma$  = 2.01 S/m;  $\epsilon_r$  = 37.9;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(7.54, 7.54, 7.54) @ 2600 MHz; Calibrated: 29.06.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.12.2019
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

# 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 = 121.2 V/m; Power Drift = -0.04 dB Peak SAR (extrapolated) = 29.3 W/kg SAR(1 g) = 14.5 W/kg; SAR(10 g) = 6.40 W/kg Smallest distance from peaks to all points 3 dB below = 8.9 mm Ratio of SAR at M2 to SAR at M1 = 49.4% Maximum value of SAR (measured) = 24.4 W/kg



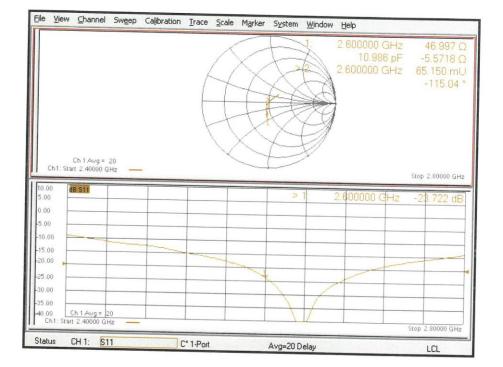
3 d D = 24.4 W/kg = 13.87 d D W/k

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Impedance Measurement Plot for Head TSL

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## DASY5 Validation Report for Body TSL

Date: 21.07.2020

Test Laboratory: SPEAG, Zurich, Switzerland

# DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1012

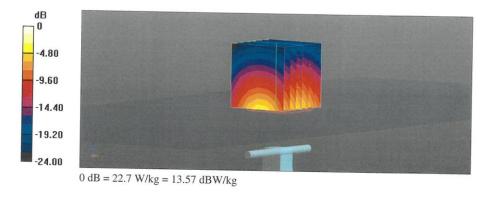
Communication System: UID 0 - CW; Frequency: 2600 MHz Medium parameters used: f = 2600 MHz;  $\sigma$  = 2.20 S/m;  $\epsilon_r$  = 51.0;  $\rho$  = 1000 kg/m<sup>3</sup> Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(7.68, 7.68, 7.68) @ 2600 MHz; Calibrated: 29.06.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.12.2019
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.4(1527); SEMCAD X 14.6.14(7483)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mmReference Value = 110.5 V/m; Power Drift = -0.09 dB Peak SAR (extrapolated) = 28.0 W/kg **SAR(1 g) = 14.0 W/kg; SAR(10 g) = 6.20 W/kg** Smallest distance from peaks to all points 3 dB below = 8 mm Ratio of SAR at M2 to SAR at M1 = 50.8% Maximum value of SAR (measured) = 22.7 W/kg

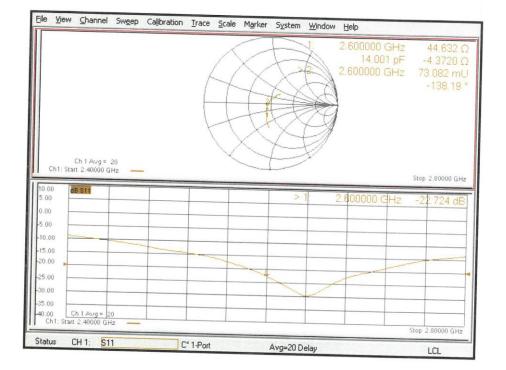


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Impedance Measurement Plot for Body TSL

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## **5G Dipole Calibration Certificate**

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



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

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alibration procedure(s)   CA CAL-22.v5 Calibration Procedure for SAR Validation Sources between 3-10 GHz     alibration date:   July 27, 2020     his calibration certificate documents the traceability to national standards, which realize the physical units of measurements (S): he measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.     II calibration shave been conducted in the closed laboratory facility: environment temperature (22 ± 3)*C and humidity < 70%.     alibration Equipment used (M&TE critical for calibration)     rimary Standards   ID #   Cal Date (Certificate No.)   Scheduled Calibration     rower ensor NRP-291   SN: 104778   01-Apr-20 (No. 217-03100)   Apr-21     ower sensor NRP-291   SN: 103244   01-Apr-20 (No. 217-03100)   Apr-21     ower sensor NRP-291   SN: 103245   01-Apr-20 (No. 217-03100)   Apr-21     user sensor NRP-291   SN: 103245   01-Apr-20 (No. 217-03106)   Apr-21     user sensor NRP-291   SN: 00327   31-Mar-20 (No. 217-03106)   Apr-21     user sensor NRP-291   SN: 01   27-Ober-19 (No. DAE4-601_Dec19)   Dec-20     ieference Probe EX3DV4   SN: 601   27-Ober-19 (No. DAE4-601_Dec19)   Dec-20     user sensor NRP 8481A   SN: CB39512475   30-Oct+1	ient CTTL-BJ (Auden	1)	Certificat	e No: D5GHzV2-1060_Jul20
alibration procedure(s)   QA CAL-22.v5 Calibration Procedure for SAR Validation Sources between 3-10 GHz     alibration date:   July 27, 2020     his calibration certificate documents the traceability to national standards, which realize the physical units of measurements (S): he measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.     all calibration shave been conducted in the closed laboratory facility: environment temperature (22 ± 3)*C and humidity < 70%.     alibration Equipment used (M&TE critical for calibration)     trimary Standards   D #     Core and the NPP-291   SN: 104778     SN: 103244   01-Apr-20 (No. 217-03100)     tower sensor NPP-291   SN: 103244     SN: 103245   01-Apr-20 (No. 217-03100)     Yape-N mismatch combination   SN: 8149394 (20k)     SN: 601   27-0bec-19 (No. 217-03100)   Apr-21     Yape-N mismatch combination   SN: 601   27-0bec-19 (No. 247-03106)   Apr-21     Yape-N mismatch combination   SN: 601   27-0bec-19 (No. 247-03101)   Apr-21     Yape-N mismatch combination   SN: 601   27-0bec-19 (No. DAE4-601_Dec19)   Dec-20     Yabed 4   SN: 601   27-0bec-19 (No. DAE4-601_Dec19)   Dec-20     Yower sensor NP P481A   SN:	ALIBRATION CI	ERTIFICATE		
Calibration Procedure for SAR Validation Sources between 3-10 GHz     Calibration date:   July 27, 2020     This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.     ull calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.     ull calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.     Calibration Equipment used (M&TE critical for calibration)     Viewer meter NRP   SN: 104778   01-Apr-20 (No. 217-03100)   Apr-21     Vower sensor NRP-291   SN: 103244   01-Apr-20 (No. 217-0310)   Apr-21     Vower sensor NRP-291   SN: 103245   01-Apr-20 (No. 217-0310)   Apr-21     Vower sensor NRP-291   SN: 103245   01-Apr-20 (No. 217-03104)   Apr-21     Vower sensor NRP-291   SN: 103245   01-Apr-20 (No. 217-03104)   Apr-21     Vower sensor NRP-291   SN: 103245   01-Apr-20 (No. 217-03104)   Apr-21     Vower sensor NRP-291   SN: 601   27-Dec-19 (No. DAE4-601_Dec19)   Dec-20	Dbject	D5GHzV2 - SN:1	060	
Calibration Procedure for SAR Validation Sources between 3-10 GHz     Calibration date:   July 27, 2020     This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.     All calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.     Valibration Equipment used (M&TE critical for calibration)   Cal Date (Certificate No.)   Scheduled Calibration     Primary Standards   ID #   Cal Date (Certificate No.)   Scheduled Calibration     Power sensor NRP-Z91   SN: 103244   01-Apr-20 (No. 217-03100)   Apr-21     Yower sensor NRP-Z91   SN: 103245   01-Apr-20 (No. 217-0310)   Apr-21     Yower sensor NRP-Z91   SN: 103245   01-Apr-20 (No. 217-0310)   Apr-21     Yower sensor NRP-Z91   SN: 103245   01-Apr-20 (No. 217-0310)   Apr-21     Yower sensor NRP-Z91   SN: 310384 (20X)   31-Mar-20 (No. 217-03104)   Apr-21     Yower sensor NRP-Z91   SN: 601   27-Dec-19 (No. DAE4-601_Dec19)   Dec-20     Secondary Standards   ID # </td <td></td> <td></td> <td></td> <td></td>				
Calibration date:   July 27, 2020     This calibration cartificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.     All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.	Calibration procedure(s)	QA CAL-22.v5		
This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificates.     All calibration Equipment used (M&TE critical for calibration)   ID #   Cal Date (Certificate No.)   Scheduled Calibration     Primary Standards   ID #   Cal Date (Certificate No.)   Scheduled Calibration     Power meter NRP   SN: 104778   01-Apr-20 (No. 217-03100)(03101)   Apr-21     Power sensor NRP-Z91   SN: 103244   01-Apr-20 (No. 217-03100)   Apr-21     Power sensor NRP-Z91   SN: 103245   01-Apr-20 (No. 217-03100)   Apr-21     Power sensor NRP-Z91   SN: 103245   01-Apr-20 (No. 217-03100)   Apr-21     Reference 20 dB Attenuator   SN: 5032   31-Mar-20 (No. 217-03104)   Apr-21     Reference Probe EX3DV4   SN: 503   31-Dec-19 (No. DAE4-601_Dec19)   Dec-20     Secondary Standards   ID #   Check Date (in house)   Scheduled Check     Power sensor HP 8481A   SN: US37282783   07-Oct-15 (in house check Cot-18)   In house check: Cot-20     Power sensor HP 8481A   SN: US37282783   07-Oct-15 (in house check Cot-18)   In house check: Cot-20     Powe		Calibration Proce	dure for SAR Validation Sour	ces between 3-10 GHz
This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificates.     All calibration Equipment used (M&TE critical for calibration)   ID #   Cal Date (Certificate No.)   Scheduled Calibration     Primary Standards   ID #   Cal Date (Certificate No.)   Scheduled Calibration     Power meter NRP   SN: 104778   01-Apr-20 (No. 217-03100)(03101)   Apr-21     Power sensor NRP-Z91   SN: 103244   01-Apr-20 (No. 217-03100)   Apr-21     Power sensor NRP-Z91   SN: 103245   01-Apr-20 (No. 217-03100)   Apr-21     Power sensor NRP-Z91   SN: 103245   01-Apr-20 (No. 217-03100)   Apr-21     Reference 20 dB Attenuator   SN: 5032   31-Mar-20 (No. 217-03104)   Apr-21     Reference Probe EX3DV4   SN: 503   31-Dec-19 (No. DAE4-601_Dec19)   Dec-20     Secondary Standards   ID #   Check Date (in house)   Scheduled Check     Power sensor HP 8481A   SN: US37282783   07-Oct-15 (in house check Cot-18)   In house check: Cot-20     Power sensor HP 8481A   SN: US37282783   07-Oct-15 (in house check Cot-18)   In house check: Cot-20     Powe				
This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificates.     All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.				
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The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.     All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.				
All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.				
Power meter NRP     SN: 104778     01-Apr-20 (No. 217-03100/03101)     Apr-21       Power sensor NRP-Z91     SN: 103244     01-Apr-20 (No. 217-03100)     Apr-21       Power sensor NRP-Z91     SN: 103245     01-Apr-20 (No. 217-03100)     Apr-21       Reference 20 dB Attenuator     SN: BH9394 (20k)     31-Mar-20 (No. 217-03106)     Apr-21       SN: 10924     SN: 31082 / 06327     31-Mar-20 (No. 217-03106)     Apr-21       Reference Probe EX3DV4     SN: 31082 / 06327     31-Mar-20 (No. 217-03104)     Apr-21       DAE4     SN: 601     27-Dec-19 (No. 217-03104)     Apr-21       SN: 601     27-Dec-19 (No. 24-601_Dec19)     Dec-20       Secondary Standards     ID #     Check Date (in house)     Scheduled Check       Power sensor HP 8481A     SN: US37292783     07-Oct-15 (in house check Cot-18)     In house check: Oct-20       Power sensor HP 8481A     SN: 10972     15-Jun-15 (in house check Oct-18)     In house check: Oct-20       RF generator R&S SMT-06     SN: US41080477     31-Mar-14 (in house check Oct-19)     In house check: Oct-20       Natwork Analyzer Agilent E8358A     SN: US41080477     31-Mar-14 (in house check Oct-19)     In house check: Oct-20 </td <td></td> <td></td> <td></td> <td></td>				
Calibration Equipment used (M&TE critical for calibration)     Primary Standards   ID #   Cal Date (Certificate No.)   Scheduled Calibration     Power meter NRP   SN: 104778   01-Apr-20 (No. 217-03100/03101)   Apr-21     Power sensor NRP-Z91   SN: 103245   01-Apr-20 (No. 217-03100)   Apr-21     Power sensor NRP-Z91   SN: 103245   01-Apr-20 (No. 217-03106)   Apr-21     Reference 20 dB Attenuator   SN: BH3934 (20k)   31-Mar-20 (No. 217-03106)   Apr-21     Reference Probe EX3DV4   SN: 310982 / 06327   31-Mar-20 (No. 217-03106)   Apr-21     Reference Probe EX3DV4   SN: 3503   31-Dec-19 (No. DAE4-601_Dec19)   Dec-20     Secondary Standards   ID #   Check Date (in house)   Scheduled Check     Power sensor HP 8481A   SN: GB39512475   30-Oct-14 (in house check Cot-18)   In house check: Oct-20     Power sensor HP 8481A   SN: W1Y41092317   07-Oct-15 (in house check Oct-18)   In house check: Oct-20     RF generator R&S SMT-06   SN: US41080477   31-Mar-14 (in house check Oct-18)   In house check: Oct-20     Name   Function   Signature     Calibrated by:   Name   Function   Signature     Approved	The measurements and the uncerta	ainties with confidence p	robability are given on the following page	es and are part of the certificate.
Calibration Equipment used (M&TE critical for calibration)     Primary Standards   ID #   Cal Date (Certificate No.)   Scheduled Calibration     Power meter NRP   SN: 104778   01-Apr-20 (No. 217-03100/03101)   Apr-21     Power sensor NRP-Z91   SN: 103245   01-Apr-20 (No. 217-03100)   Apr-21     Power sensor NRP-Z91   SN: 103245   01-Apr-20 (No. 217-03106)   Apr-21     Reference 20 dB Attenuator   SN: BH3934 (20k)   31-Mar-20 (No. 217-03106)   Apr-21     Reference Probe EX3DV4   SN: 310982 / 06327   31-Mar-20 (No. 217-03106)   Apr-21     Reference Probe EX3DV4   SN: 3503   31-Dec-19 (No. DAE4-601_Dec19)   Dec-20     Secondary Standards   ID #   Check Date (in house)   Scheduled Check     Power sensor HP 8481A   SN: GB39512475   30-Oct-14 (in house check Cot-18)   In house check: Oct-20     Power sensor HP 8481A   SN: W1Y41092317   07-Oct-15 (in house check Oct-18)   In house check: Oct-20     RF generator R&S SMT-06   SN: US41080477   31-Mar-14 (in house check Oct-18)   In house check: Oct-20     Name   Function   Signature     Calibrated by:   Name   Function   Signature     Approved				
Primary Standards   ID #   Cal Date (Certificate No.)   Scheduled Calibration     Power meter NRP   SN: 104778   01-Apr-20 (No. 217-03100/03101)   Apr-21     Power sensor NRP-Z91   SN: 103244   01-Apr-20 (No. 217-03100)   Apr-21     Power sensor NRP-Z91   SN: 103245   01-Apr-20 (No. 217-03100)   Apr-21     Power sensor NRP-Z91   SN: 103245   01-Apr-20 (No. 217-03106)   Apr-21     Reference 20 dB Attenuator   SN: 81H9394 (20k)   31-Mar-20 (No. 217-03104)   Apr-21     Type-N mismatch combination   SN: 310982 / 06327   31-Mar-20 (No. 217-03104)   Apr-21     Reference Probe EX3DV4   SN: 601   27-Dec-19 (No. DAE4-601_Dec19)   Dec-20     Secondary Standards   ID #   Check Date (in house)   Scheduled Check     Power sensor HP 8481A   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: US41080477   31-Mar-14 (in house check Oct-18)   In house check: Oct-20     Re generator R&S SMT-06   SN: US41080477   31-Mar-14 (in house check Oct-18)   In house check: Oct-20 <t< td=""><td>All calibrations have been conducte</td><td>ed in the closed laborato</td><td>y facility: environment temperature (22 ±</td><td>± 3)°C and humidity &lt; 70%.</td></t<>	All calibrations have been conducte	ed in the closed laborato	y facility: environment temperature (22 ±	± 3)°C and humidity < 70%.
Primary Standards     ID #     Cal Date (Certificate No.)     Scheduled Calibration       Power metter NRP     SN: 104778     01-Apr-20 (No. 217-03100/03101)     Apr-21       Power sensor NRP-Z91     SN: 103244     01-Apr-20 (No. 217-03100)     Apr-21       Power sensor NRP-Z91     SN: 103245     01-Apr-20 (No. 217-03100)     Apr-21       Reference 20 dB Attenuator     SN: 8BH9394 (20k)     31-Mar-20 (No. 217-03106)     Apr-21       Type-N mismatch combination     SN: 310982 / 06327     31-Mar-20 (No. 217-03104)     Apr-21       Reference Probe EX3DV4     SN: 601     27-Dec-19 (No. EX3-3503_Dec19)     Dec-20       Secondary Standards     ID #     Check Date (in house)     Scheduled Check       Power sensor HP 8481A     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: US41080477     31-Mar-14 (in house check Oct-18)     In house check: Oct-20       RF generator R&S SMT-06     SN: US41080477     31-Mar-14 (in house check Oct-18)     In house check: Oct-20       Name     Function				
Power meter NRP     SN: 104778     01-Apr-20 (No. 217-03100/03101)     Apr-21       Power sensor NRP-Z91     SN: 103244     01-Apr-20 (No. 217-03100)     Apr-21       Power sensor NRP-Z91     SN: 103245     01-Apr-20 (No. 217-03100)     Apr-21       Reference 20 dB Attenuator     SN: BH9394 (20k)     31-Mar-20 (No. 217-03106)     Apr-21       SN: 10982 / 06327     31-Mar-20 (No. 217-03106)     Apr-21       Reference Probe EX3DV4     SN: 310982 / 06327     31-Mar-20 (No. 217-03104)     Apr-21       DAE4     SN: 601     27-Dec-19 (No. 217-03104)     Apr-21       Secondary Standards     ID #     Check Date (in house)     Dec-20       Secondary Standards     ID #     Check Date (in house)     Scheduled Check       Power sensor HP 8481A     SN: US37292783     07-Oct-15 (in house check Cot-18)     In house check: Oct-20       Power sensor HP 8481A     SN: 10972     15-Jun-15 (in house check Oct-18)     In house check: Oct-20       RF generator R&S SMT-06     SN: US41080477     31-Mar-14 (in house check Oct-19)     In house check: Oct-20       Name     Function     Signature     Mithael Weber     Laboratory Technician     Mithael Mi	Calibration Equipment used (M& I E	critical for calibration)		
Power meter NRP     SN: 104778     01-Apr-20 (No. 217-03100/03101)     Apr-21       Power sensor NRP-Z91     SN: 103244     01-Apr-20 (No. 217-03100)     Apr-21       Power sensor NRP-Z91     SN: 103245     01-Apr-20 (No. 217-03100)     Apr-21       Power sensor NRP-Z91     SN: 103245     01-Apr-20 (No. 217-03101)     Apr-21       Reference 20 dB Attenuator     SN: BH9394 (20k)     31-Mar-20 (No. 217-03104)     Apr-21       SN: 310982 / 06327     31-Mar-20 (No. 217-03104)     Apr-21       SN: 310982 / 06327     31-Mar-20 (No. 217-03104)     Apr-21       SN: 3503     31-Dec-19 (No. 247-03104)     Apr-21       SN: 601     27-Dec-19 (No. 247-03104)     Apr-21       SN: 601     27-Dec-19 (No. 247-03104)     Apr-21       SN: 601     27-Dec-19 (No. DAE4-601_Dec19)     Dec-20       Secondary Standards     ID #     Check Date (in house)     Scheduled Check       Power sensor HP 8481A     SN: GB39512475     30-Oct-14 (in house check Cot-18)     In house check: Oct-20       Power sensor HP 8481A     SN: 109372     15-Jun-15 (in house check Oct-18)     In house check: Oct-20       SN: 109872     SN: US41080477	Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power sensor NRP-Z91 SN: 103245 01-Apr-20 (No. 217-03101) Apr-21   Reference 20 dB Attenuator SN: 819394 (20k) 31-Mar-20 (No. 217-03106) Apr-21   SN: 910982 / 06327 31-Mar-20 (No. 217-03104) Apr-21   SN: 310982 / 06327 31-Mar-20 (No. 217-03104) Apr-21   SN: 3503 31-Dec-19 (No. EX3-3503_Dec19) Dec-20   Secondary Standards ID # 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: 103272 15-Jun-15 (in house check Oct-18) In house check: Oct-20   SN: 10972 15-Jun-15 (in house check Oct-18) In house check: Oct-20   SN: US41080477 31-Mar-14 (in house check Oct-18) In house check: Oct-20   SN: US41080477 31-Mar-14 (in house check Oct-19) In house check: Oct-20   SN: US41080477 31-Mar-14 (in house check Oct-19) In house check: Oct-20   SN: US41080477 31-Mar-14 (in house check Oct-19) In house check: Oct-20   SN: US41080477 31-Mar-14 (in house check Oct-19) In house check: Oct-20   SN: US41080477 31-Mar-14 (in house check Oct-19) In house	and a second	SN: 104778		Apr-21
Reference 20 dB Attenuator   SN: BH9394 (20k)   31-Mar-20 (No. 217-03106)   Apr-21     Type-N mismatch combination   SN: 310982 / 06327   31-Mar-20 (No. 217-03104)   Apr-21     SN: 3503   31-Dec-19 (No. EX3-5503_Dec19)   Dec-20     Secondary Standards   ID #   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: W141092317   07-Oct-15 (in house check Oct-18)   In house check: Oct-20     SN: 10972   15-Jun-15 (in house check Oct-18)   In house check: Oct-20   In house check: Oct-20     RF generator R&S SMT-06   SN: US41080477   31-Mar-14 (in house check Oct-19)   In house check: Oct-20     Name   Function   Signature     Calibrated by:   Name   Function   Signature     Approved by:   Katja Pokovic   Technical Manager   July 28, 2020	Power sensor NRP-Z91	SN: 103244	01-Apr-20 (No. 217-03100)	Apr-21
Type-N mismatch combination   SN: 310982 / 06327   31-Mar-20 (No. 217-03104)   Apr-21     Reference Probe EX3DV4   SN: 3503   31-Dec-19 (No. EX3-3503_Dec19)   Dec-20     Secondary Standards   ID #   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     SN: 100972   15-Jun-15 (in house check Oct-18)   In house check: Oct-20   In house check: Oct-20     Network Analyzer Agilent E8358A   Ni: W41092317   07-Oct-15 (in house check Oct-18)   In house check: Oct-20     Name   Function   Signature   In house check: Oct-20   In house check: Oct-20     Name   Function   Signature   Mithael Weber   Laboratory Technician   Mithael Signature     Approved by:   Katja Pokovic   Technical Manager   Jusued: July 28, 2020   July 28, 2020	Power sensor NRP-Z91	SN: 103245	01-Apr-20 (No. 217-03101)	Apr-21
Reference Probe EX3DV4 SN: 3503 31-Dec-19 (No. EX3-3503_Dec19) Dec-20   DAE4 SN: 601 27-Dec-19 (No. DAE4-601_Dec19) Dec-20   Secondary Standards ID # 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: 100372 15-Jun-15 (in house check Oct-18) In house check: Oct-20   RF generator R&S SMT-06 SN: US41080477 31-Mar-14 (in house check Oct-19) In house check: Oct-20   Network Analyzer Agilent E8358A Name Function Signature   Calibrated by: Name Function Signature   Approved by: Katja Pokovic Technical Manager July 28, 2020	Reference 20 dB Attenuator	SN: BH9394 (20k)	31-Mar-20 (No. 217-03106)	Apr-21
DAE4 SN: 601 27-Dec-19 (No. DAE4-601_Dec19) Dec-20   Secondary Standards ID # 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: Michael Weber Laboratory Technician Mil/Mbbb   Approved by: Katja Pokovic Technical Manager Jusuet: July 28, 2020	Type-N mismatch combination	SN: 310982 / 06327	31-Mar-20 (No. 217-03104)	Apr-21
Secondary Standards   ID #   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     Power sensor HP 8481A   SN: 100972   15-Jun-15 (in house check Oct-18)   In house check: Oct-20     RF generator R&S SMT-06   SN: US41080477   31-Mar-14 (in house check Oct-19)   In house check: Oct-20     Network Analyzer Agilent E8358A   SN: US41080477   31-Mar-14 (in house check Oct-19)   In house check: Oct-20     Calibrated by:   Name   Function   Signature     Approved by:   Katja Pokovic   Technical Manager   July 28, 2020	Reference Probe EX3DV4	SN: 3503	31-Dec-19 (No. EX3-3503_Dec19)	Dec-20
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:   Michael Weber   Laboratory Technician   Mil/L/L/L     Approved by:   Katja Pokovic   Technical Manager   Issued: July 28, 2020	DAE4	SN: 601	27-Dec-19 (No. DAE4-601_Dec19)	Dec-20
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   Pare 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: Michael Weber Laboratory Technician Mildbbc   Approved by: Katja Pokovic Technical Manager Issued: July 28, 2020	Secondary Standards	ID #	Check Date (in house)	Scheduled Check
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     Michael Weber   Laboratory Technician   Millious     Approved by:   Katja Pokovic   Technical Manager     Issued: July 28, 2020   Issued: July 28, 2020	and a second	SN: GB39512475		In house check: Oct-20
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Calibrated by: Name Function Signature Michael Weber Laboratory Technician Michael Meber Approved by: Katja Pokovic Technical Manager Issued: July 28, 2020	RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
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#### Calibration Laboratory of Schmid & Partner Engineering AG Zeughausstrasse 43, 8004 Zurich, Switzerland



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

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

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

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

#### Calibration is Performed According to the Following Standards:

- a) 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	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5250 MHz ± 1 MHz 5300 MHz ± 1 MHz 5500 MHz ± 1 MHz 5600 MHz ± 1 MHz 5750 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.4 ± 6 %	4.47 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

## SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.94 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	79.1 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	2.26 W/kg

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### Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.71 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.4 ± 6 %	4.52 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

### SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.08 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.5 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	2.30 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.9 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5300 MHz The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.3 ± 6 %	4.57 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

### SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.22 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	81.8 W/kg ± 19.9 % (k=2)

SAR averaged over 10 $\rm cm^3$ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.1 W/kg ± 19.5 % (k=2)

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Head TSL parameters at 5500 MHz The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.0 ± 6 %	4.77 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

#### SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.66 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	86.2 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	2.42 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.1 W/kg ± 19.5 % (k=2)

## Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.9 ± 6 %	4.88 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

## SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	83.3 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	2.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.6 W/kg ± 19.5 % (k=2)

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#### Head TSL parameters at 5750 MHz

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.4	5.22 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.7 ± 6 %	5.03 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

## SAR result with Head TSL at 5750 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.09 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.4 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	2.29 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.7 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5800 MHz The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.6 ± 6 %	5.09 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

### SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.16 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	81.1 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	2.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.7 W/kg ± 19.5 % (k=2)

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## Body TSL parameters at 5200 MHz

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.8 ± 6 %	5.46 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

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## SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.30 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	72.7 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.04 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.3 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5250 MHz The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.36 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.7 ± 6 %	5.53 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

## SAR result with Body TSL at 5250 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.45 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	74.2 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.09 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.8 W/kg ± 19.5 % (k=2)

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Body TSL parameters at 5300 MHz The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.6 ± 6 %	5.60 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

## SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.36 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	73.3 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.06 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.5 W/kg ± 19.5 % (k=2)

## Body TSL parameters at 5500 MHz

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.2 ± 6 %	5.87 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

## SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.86 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	78.3 W/kg ± 19.9 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL SAR measured	condition 100 mW input power	2.17 W/kg

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## Body TSL parameters at 5600 MHz

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.0 ± 6 %	6.01 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

## SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.72 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	76.8 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.15 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.4 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5750 MHz The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.3	5.94 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.8 ± 6 %	6.22 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C		

## SAR result with Body TSL at 5750 MHz

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.61 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	75.7 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.11 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.0 W/kg ± 19.5 % (k=2)

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