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 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	34.9 ± 6 %	4.50 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.84 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**77.8 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.26 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.3 W/kg ± 19.5 % (k=2)**

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	34.8 ± 6 %	4.55 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^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.87 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**78.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.25 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.3 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	34.7 ± 6 %	4.60 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^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.17 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**81.1 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 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)**

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	34.4 ± 6 %	4.80 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^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.60 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**85.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.44 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	34.3 ± 6 %	4.90 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^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**83.2 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.7 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	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	34.1 ± 6 %	5.05 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^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.12 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**80.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.8 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	34.0 ± 6 %	5.10 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^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.27 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**82.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.34 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.1 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	49.4 Ω - 6.5 jΩ
Return Loss	- 23.7 dB

Antenna Parameters with Head TSL at 5250 MHz

Impedance, transformed to feed point	47.7 Ω - 5.5 jΩ
Return Loss	- 24.3 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	46.2 Ω - 3.2 jΩ
Return Loss	- 25.8 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	50.0 Ω - 3.1 jΩ
Return Loss	- 30.1 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	53.6 Ω + 0.5 jΩ
Return Loss	- 29.2 dB

Antenna Parameters with Head TSL at 5750 MHz

Impedance, transformed to feed point	51.9 Ω - 1.7 jΩ
Return Loss	- 32.1 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	51.2 Ω - 3.2 jΩ
Return Loss	- 29.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.202 ns

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

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

Additional EUT Data

Manufactured by	SPEAG

DASY5 Validation Report for Head TSL

Date: 05.07.2022

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1060

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5250 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz, Frequency: 5800 MHz
Medium parameters used: f = 5200 MHz; σ = 4.50 S/m; ε_r = 34.9; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5250 MHz; σ = 4.55 S/m; ε_r = 34.8; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5300 MHz; σ = 4.60 S/m; ε_r = 34.7; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5500 MHz; σ = 4.80 S/m; ε_r = 34.4; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5600 MHz; σ = 4.90 S/m; ε_r = 34.3; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5750 MHz; σ = 5.05 S/m; ε_r = 34.1; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 5800 MHz; σ = 5.10 S/m; ε_r = 34.0; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.8, 5.8, 5.8) @ 5200 MHz, ConvF(5.5, 5.5, 5.5) @ 5250 MHz, ConvF(5.49, 5.49, 5.49) @ 5300 MHz, ConvF(5.25, 5.25, 5.25) @ 5500 MHz, ConvF(5.1, 5.1, 5.1) @ 5600 MHz, ConvF(5.08, 5.08, 5.08) @ 5750 MHz, ConvF(5.01, 5.01, 5.01) @ 5800 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=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 74.40 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 27.9 W/kg
SAR(1 g) = 7.84 W/kg; SAR(10 g) = 2.26 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 69.1%
Maximum value of SAR (measured) = 17.6 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 75.86 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 27.1 W/kg
SAR(1 g) = 7.87 W/kg; SAR(10 g) = 2.25 W/kg
Smallest distance from peaks to all points 3 dB below = 6.8 mm
Ratio of SAR at M2 to SAR at M1 = 69.8%
Maximum value of SAR (measured) = 17.4 W/kg

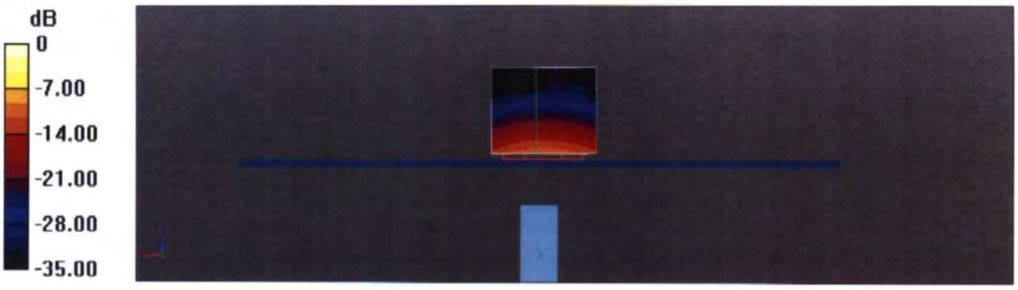
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 77.09 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 28.9 W/kg
SAR(1 g) = 8.17 W/kg; SAR(10 g) = 2.33 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 68.9%
Maximum value of SAR (measured) = 18.3 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 76.69 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 32.9 W/kg
SAR(1 g) = 8.60 W/kg; SAR(10 g) = 2.44 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 66.4%
Maximum value of SAR (measured) = 19.8 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 76.44 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 31.2 W/kg
SAR(1 g) = 8.39 W/kg; SAR(10 g) = 2.40 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 67.3%
Maximum value of SAR (measured) = 19.3 W/kg

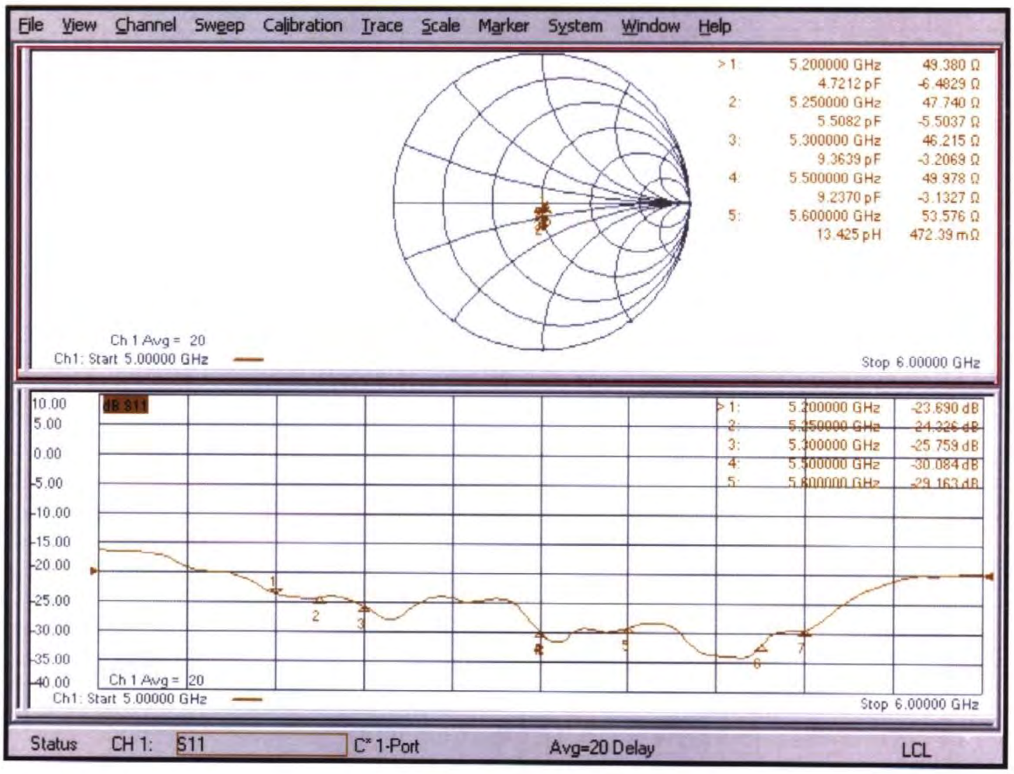
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 73.53 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 31.8 W/kg
SAR(1 g) = 8.12 W/kg; SAR(10 g) = 2.31 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 65.4%
Maximum value of SAR (measured) = 19.0 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 74.35 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 32.9 W/kg
SAR(1 g) = 8.27 W/kg; SAR(10 g) = 2.34 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 65.2%
Maximum value of SAR (measured) = 19.4 W/kg

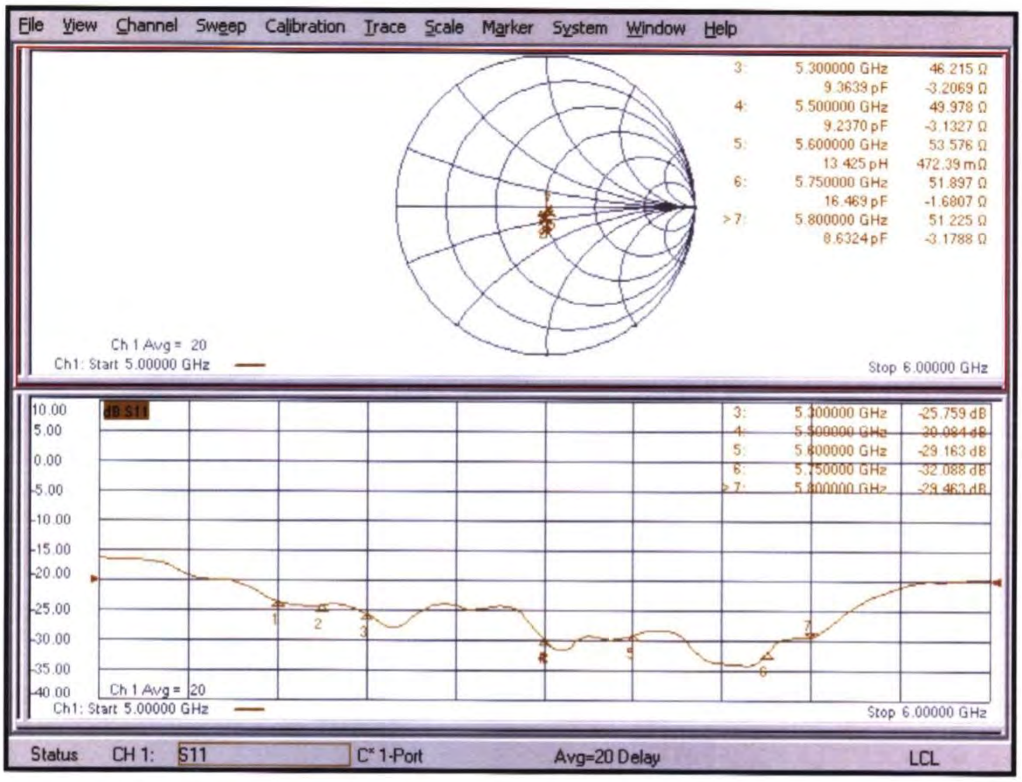


0 dB = 19.8 W/kg = 12.96 dBW/kg

Impedance Measurement Plot for Head TSL (5200, 5250, 5300, 5500, 5600 MHz)



Impedance Measurement Plot for Head TSL (5300, 5500, 5600, 5750, 5800 MHz)



Certificate No: D5GHzV2-1060_Jul22 Page 13 of 13

3500 MHz Dipole Calibration Certificate

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

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Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
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Accreditation No.: SCS 0108

Client **CTTL (Auden)**

Certificate No: D3500V2-1016_Jul22

CALIBRATION CERTIFICATE

Object: D3500V2 - SN:1016

Calibration procedure(s): QA CAL-22.v6
Calibration Procedure for SAR Validation Sources between 3-10 GHz

Calibration date: July 01, 2022

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (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
Power sensor NRP-Z91	SN: 103245	04-Apr-22 (No. 217-03525)	Apr-23
Reference 20 dB Attenuator	SN: BH9394 (20k)	04-Apr-22 (No. 217-03527)	Apr-23
Type-N mismatch combination	SN: 310982 / 06327	04-Apr-22 (No. 217-03528)	Apr-23
Reference Probe EX3DV4	SN: 3503	08-Mar-22 (No. EX3-3503_Mar22)	Mar-23
DAE4	SN: 601	02-May-22 (No. DAE4-601_May22)	May-23

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-22

	Name	Function	Signature
Calibrated by:	Joanna Lleshaj	Laboratory Technician	
Approved by:	Sven Kühn	Technical Manager	S. Kn

Issued: July 11, 2022

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Calibration Laboratory of
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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 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	3400 MHz ± 1 MHz 3500 MHz ± 1 MHz 3600 MHz ± 1 MHz	

Head TSL parameters at 3400 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	38.0	2.81 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.3 ± 6 %	2.84 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 3400 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.85 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**68.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.57 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**25.6 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 3500 MHz

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 %	2.92 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 3500 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.79 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**67.5 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.54 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**25.3 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 3600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	37.8	3.02 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.1 ± 6 %	2.99 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 3600 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.66 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**66.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.49 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.8 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 3400 MHz

Impedance, transformed to feed point	46.4 Ω - 8.7 jΩ
Return Loss	- 20.2 dB

Antenna Parameters with Head TSL at 3500 MHz

Impedance, transformed to feed point	55.1 Ω - 3.7 jΩ
Return Loss	- 24.5 dB

Antenna Parameters with Head TSL at 3600 MHz

Impedance, transformed to feed point	59.5 Ω - 0.4 jΩ
Return Loss	- 21.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.137 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: 01.07.2022

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 3500 MHz; Type: D3500V2; Serial: D3500V2 - SN:1016

Communication System: UID 0 - CW; Frequency: 3500 MHz, Frequency: 3400 MHz, Frequency: 3600 MHz
Medium parameters used: f = 3500 MHz; σ = 2.92 S/m; ε_r = 37.2; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 3400 MHz; σ = 2.84 S/m; ε_r = 37.3; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 3600 MHz; σ = 2.99 S/m; ε_r = 37.1; ρ = 1000 kg/m^3
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, ConvF(7.97, 7.97, 7.97) @ 3400 MHz, ConvF(7.91, 7.91, 7.91) @ 3600 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)

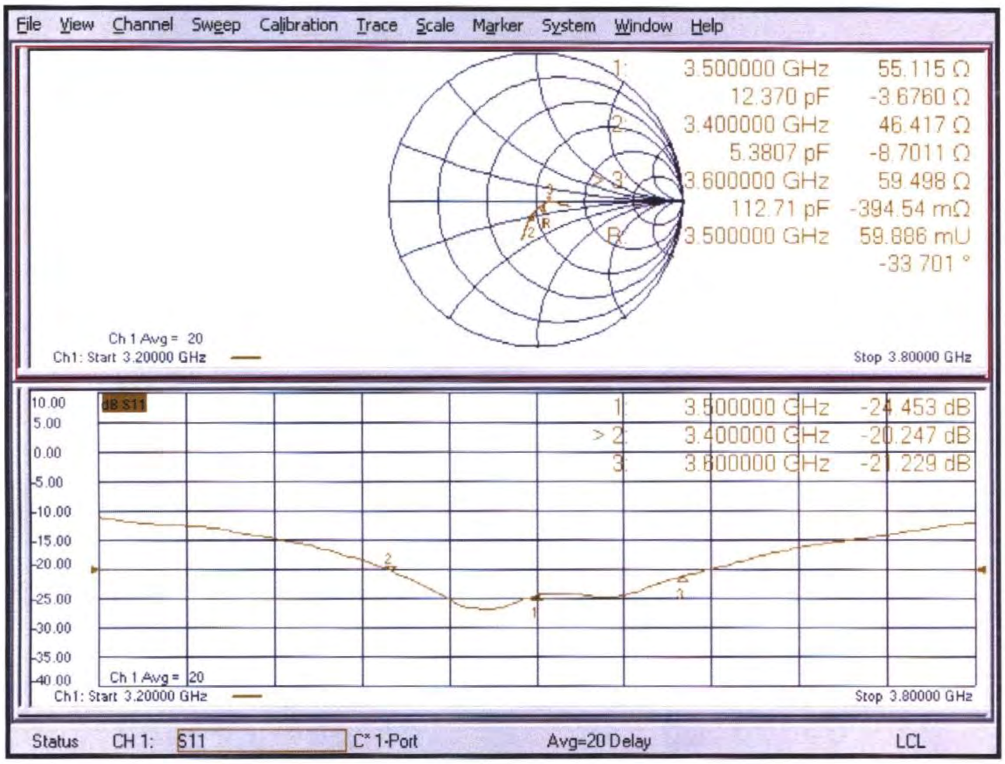
Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm, f=3500MHz/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 69.69 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 18.5 W/kg
SAR(1 g) = 6.79 W/kg; SAR(10 g) = 2.54 W/kg
Smallest distance from peaks to all points 3 dB below = 8.6 mm
Ratio of SAR at M2 to SAR at M1 = 74.7%
Maximum value of SAR (measured) = 13.1 W/kg

Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm, f=3400MHz/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 70.52 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 18.5 W/kg
SAR(1 g) = 6.85 W/kg; SAR(10 g) = 2.57 W/kg
Smallest distance from peaks to all points 3 dB below = 8.4 mm
Ratio of SAR at M2 to SAR at M1 = 75.4%
Maximum value of SAR (measured) = 12.9 W/kg

Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm, f=3600MHz/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 68.51 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 18.5 W/kg
SAR(1 g) = 6.66 W/kg; SAR(10 g) = 2.49 W/kg
Smallest distance from peaks to all points 3 dB below = 8.4 mm
Ratio of SAR at M2 to SAR at M1 = 74.3%
Maximum value of SAR (measured) = 12.9 W/kg

0 dB = 13.1 W/kg = 11.17 dBW/kg

Impedance Measurement Plot for Head TSL



3700 MHz Dipole Calibration Certificate

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

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Accreditation No.: **SCS 0108**

Client **CTTL (Auden)**

Certificate No: **D3700V2-1004_Jul22**

CALIBRATION CERTIFICATE

Object	D3700V2 - SN:1004
Calibration procedure(s)	QA CAL-22.v6 Calibration Procedure for SAR Validation Sources between 3-10 GHz
Calibration date:	July 01, 2022

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (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
Power sensor NRP-Z91	SN: 103245	04-Apr-22 (No. 217-03525)	Apr-23
Reference 20 dB Attenuator	SN: BH9394 (20k)	04-Apr-22 (No. 217-03527)	Apr-23
Type-N mismatch combination	SN: 310982 / 06327	04-Apr-22 (No. 217-03528)	Apr-23
Reference Probe EX3DV4	SN: 3503	08-Mar-22 (No. EX3-3503_Mar22)	Mar-23
DAE4	SN: 601	02-May-22 (No. DAE4-601_May22)	May-23

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-22

	Name	Function	Signature
Calibrated by:	Joanna Lleshaj	Laboratory Technician	
Approved by:	Sven Kühn	Technical Manager	

Issued: July 11, 2022

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

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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 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	3700 MHz ± 1 MHz 3800 MHz ± 1 MHz	

Head TSL parameters at 3700 MHz

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	----	----

SAR result with Head TSL at 3700 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.74 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**67.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.44 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.4 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 3800 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	37.6	3.22 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.8 ± 6 %	3.15 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 3800 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.57 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**65.7 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.9 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 3700 MHz

Impedance, transformed to feed point	48.6 Ω - 6.6 jΩ
Return Loss	- 23.3 dB

Antenna Parameters with Head TSL at 3800 MHz

Impedance, transformed to feed point	57.5 Ω - 5.9 jΩ
Return Loss	- 21.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.138 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: 01.07.2022

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 3700 MHz; Type: D3700V2; Serial: D3700V2 - SN:1004

Communication System: UID 0 - CW; Frequency: 3700 MHz, Frequency: 3800 MHz
Medium parameters used: f = 3700 MHz; σ = 3.07 S/m; ε_r = 37; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 3800 MHz; σ = 3.15 S/m; ε_r = 36.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

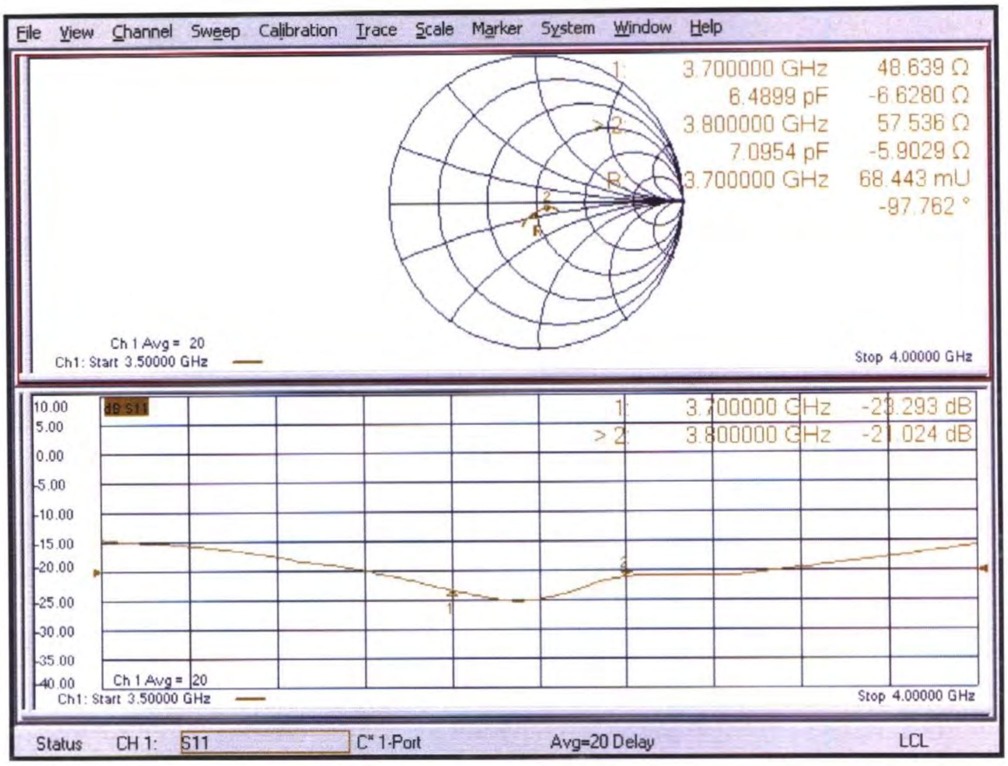
- Probe: EX3DV4 - SN3503; ConvF(7.73, 7.73, 7.73) @ 3700 MHz, ConvF(7.73, 7.73, 7.73) @ 3800 MHz; Calibrated: 08.03.2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 02.05.2022
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 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 = 69.98 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 19.1 W/kg
SAR(1 g) = 6.74 W/kg; SAR(10 g) = 2.44 W/kg
Smallest distance from peaks to all points 3 dB below = 8 mm
Ratio of SAR at M2 to SAR at M1 = 73.9%
Maximum value of SAR (measured) = 13.1 W/kg

Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm, f=3800MHz/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 68.05 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 18.9 W/kg
SAR(1 g) = 6.57 W/kg; SAR(10 g) = 2.40 W/kg
Smallest distance from peaks to all points 3 dB below = 8.2 mm
Ratio of SAR at M2 to SAR at M1 = 73.1%
Maximum value of SAR (measured) = 13.0 W/kg

0 dB = 13.1 W/kg = 11.17 dBW/kg

Impedance Measurement Plot for Head TSL



3900 MHz Dipole Calibration Certificate

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

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Accreditation No.: SCS 0108

Client **CTTL (Auden)** **Certificate No: D3900V2-1024_Jul22**

CALIBRATION CERTIFICATE

Object	D3900V2 - SN:1024
Calibration procedure(s)	QA CAL-22.v6 Calibration Procedure for SAR Validation Sources between 3-10 GHz
Calibration date:	July 01, 2022

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (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
Power sensor NRP-Z91	SN: 103245	04-Apr-22 (No. 217-03525)	Apr-23
Reference 20 dB Attenuator	SN: BH9394 (20k)	04-Apr-22 (No. 217-03527)	Apr-23
Type-N mismatch combination	SN: 310982 / 06327	04-Apr-22 (No. 217-03528)	Apr-23
Reference Probe EX3DV4	SN: 3503	08-Mar-22 (No. EX3-3503_Mar22)	Mar-23
DAE4	SN: 601	02-May-22 (No. DAE4-601_May22)	May-23

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
Power sensor HP 8481A	SN: MY41093315	07-Oct-15 (in house check Oct-20)	In house check: Oct-22
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-20)	In house check: Oct-22
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-20)	In house check: Oct-22

	Name	Function	Signature
Calibrated by:	Joanna Lleshaj	Laboratory Technician	
Approved by:	Sven Kühn	Technical Manager	

Issued: July 11, 2022

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

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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 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	3900 MHz ± 1 MHz 4000 MHz ± 1 MHz 4100 MHz ± 1 MHz	

Head TSL parameters at 3900 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	37.5	3.32 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.7 ± 6 %	3.24 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 3900 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.96 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**69.6 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (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 4000 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	37.4	3.43 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.6 ± 6 %	3.33 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 4000 MHz

SAR averaged over 1 cm^3 (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)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.6 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 4100 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	37.2	3.53 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.5 ± 6 %	3.41 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 4100 MHz

SAR averaged over 1 cm^3 (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	**68.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (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)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 3900 MHz

Impedance, transformed to feed point	46.3 Ω - 6.6 jΩ
Return Loss	- 22.1 dB

Antenna Parameters with Head TSL at 4000 MHz

Impedance, transformed to feed point	52.1 Ω - 2.7 jΩ
Return Loss	- 29.5 dB

Antenna Parameters with Head TSL at 4100 MHz

Impedance, transformed to feed point	59.8 Ω - 1.9 jΩ
Return Loss	- 20.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.107 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: 01.07.2022

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 3900 MHz; Type: D3900V2; Serial: D3900V2 - SN:1024

Communication System: UID 0 - CW; Frequency: 3900 MHz, Frequency: 4000 MHz, Frequency: 4100 MHz
Medium parameters used: f = 3900 MHz; σ = 3.24 S/m; ε_r = 36.7; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 4000 MHz; σ = 3.33 S/m; ε_r = 36.6; ρ = 1000 kg/m^3 ,
Medium parameters used: f = 4100 MHz; σ = 3.41 S/m; ε_r = 36.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(7.39, 7.39, 7.39) @ 3900 MHz, ConvF(7.39, 7.39, 7.39) @ 4000 MHz, ConvF(7.26, 7.26, 7.26) @ 4100 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)

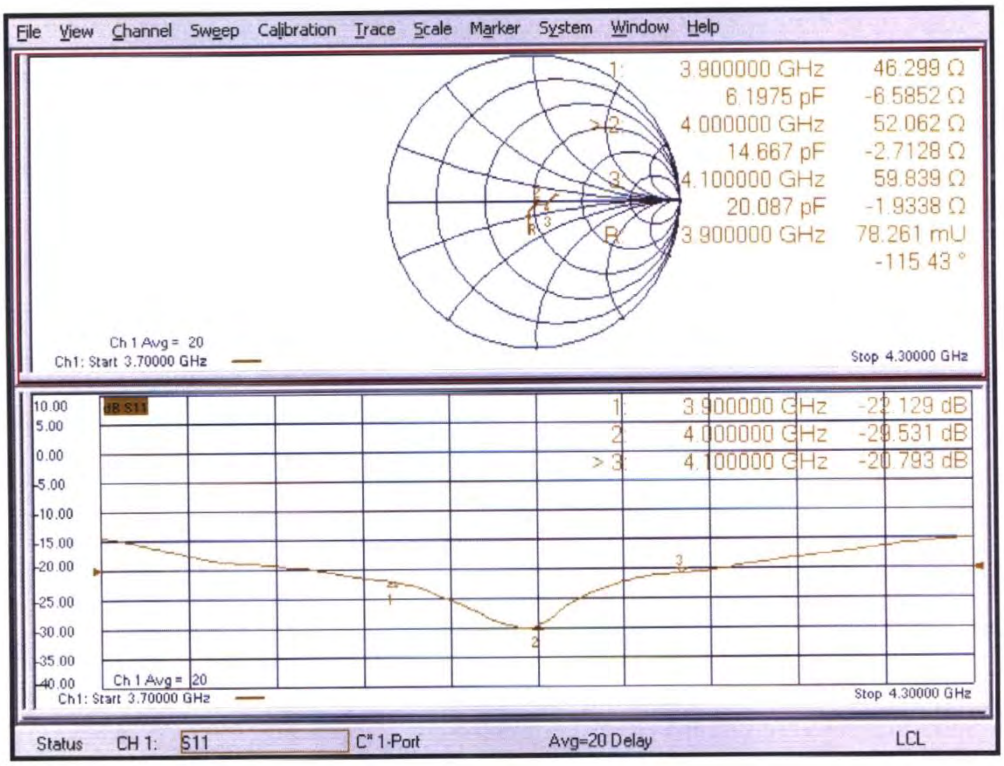
Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm, f=3900MHz/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 71.06 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 20.0 W/kg
SAR(1 g) = 6.96 W/kg; SAR(10 g) = 2.42 W/kg
Smallest distance from peaks to all points 3 dB below = 8 mm
Ratio of SAR at M2 to SAR at M1 = 74.2%
Maximum value of SAR (measured) = 13.9 W/kg

Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm, f=4000MHz/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 71.32 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 20.0 W/kg
SAR(1 g) = 6.82 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 = 73.6%
Maximum value of SAR (measured) = 13.8 W/kg

Dipole Calibration for Head Tissue/Pin=100 mW, d=10mm, f=4100MHz/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 69.19 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 19.7 W/kg
SAR(1 g) = 6.82 W/kg; SAR(10 g) = 2.37 W/kg
Smallest distance from peaks to all points 3 dB below = 8 mm
Ratio of SAR at M2 to SAR at M1 = 74.2%
Maximum value of SAR (measured) = 13.7 W/kg

0 dB = 13.9 W/kg = 11.43 dBW/kg

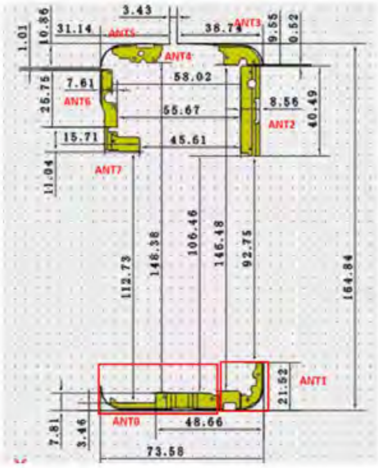
Impedance Measurement Plot for Head TSL



Certificate No: D3900V2-1024_Jul22 Page 8 of 8

ANNEX I SAR Sensor Triggering Data Summary

SAR sensor trigger distance



distance test	PH0	PH1	PH2	PH3	PH4
	Bottom Right ANT0	Bottom Left ANT1	Top Right ANT3		Top Right ANT4/5
front	17mm	14mm	15mm	NA	15mm
back	28mm	23mm	22mm	NA	20mm
top	NA	NA	23mm	NA	25mm
bottom	20mm	20mm	NA	NA	NA
left	NA	21mm	15mm	NA	NA
right	11mm	NA	NA	NA	16mm
Threshold	3528	1568	3042	NA	968

Per FCC KDB Publication 616217 D04v01r02, this device was tested by the manufacturer to determine the proximity sensor triggering distances for the rear and bottom edge of the device. The measured output power within ±5mm of the triggering points (or until touching the phantom) is included for rear and each applicable edge.

To ensure all production units are compliant it is necessary to test SAR at a distance 1mm less than the smallest distance from the device and SAR phantom (determined from these triggering tests according to the KDB 616217 D04v01r02) with the device at maximum output power without power reduction. These SAR tests are included in addition to the SAR tests for the device touching the SAR phantom, with reduced power.

We tested the power and got the different proximity sensor triggering distances for front/rear /bottom/right edge for ANT0. The manufacturer has declared 17mm/28mm/20mm/11mm is the most conservative triggering distance for ANT0 with front/rear/bottom/right edge. So base on the most conservative triggering distance of 17mm/28mm/20mm/11mm, additional SAR measurements were required at 16mm/27mm/19mm/10mm from the highest SAR position between front/rear/bottom/right edge of ANT0.

We tested the power and got the different proximity sensor triggering distances for front/rear /bottom/left edge for ANT1. The manufacturer has declared 14mm/23mm/20mm/21mm is the most conservative triggering distance for ANT1 with front/rear/bottom/left edge. So base on the most conservative triggering distance of 14mm/23mm/20mm/21mm, additional SAR measurements were required at 13mm/22mm/19mm/20mm from the highest SAR position between front/rear/bottom/left edge of ANT1.

We tested the power and got the different proximity sensor triggering distances for front/rear /top/left edge for ANT3. The manufacturer has declared 15mm/22mm/23mm/15mm is the most conservative triggering distance for ANT3 with front/rear/top/left edge. So base on the most conservative triggering distance of 15mm/22mm/23mm/15mm, additional SAR measurements were required at 14mm/21mm/22mm/14mm from the highest SAR position between front/rear/top/left edge of ANT3.

We tested the power and got the different proximity sensor triggering distances for front/rear /top/right edge for ANT5. The manufacturer has declared 15mm/20mm/25mm/16mm is the most conservative triggering distance for ANT5 with front/rear/top/right edge. So base on the most conservative triggering distance of 15mm/20mm/25mm/16mm, additional SAR measurements were required at 14mm/19mm/24mm/15mm from the highest SAR position between front/rear/top/right edge of ANT5.

ANT0:

Front Edge

Moving device toward the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**22**	**21**	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**
Main antenna	Far	Far	Far	Far	Far	Near	Near	Near	Near	Near	Near

Moving device away from the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
Main antenna	Near	Near	Near	Near	Near	Near	Far	Far	Far	Far	Far

Rear Edge

Moving device toward the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**33**	**32**	**31**	**30**	**29**	**28**	**27**	**26**	**25**	**24**	**23**
Main antenna	Far	Far	Far	Far	Far	Near	Near	Near	Near	Near	Near

Moving device away from the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**
Main antenna	Near	Near	Near	Near	Near	Near	Far	Far	Far	Far	Far

Bottom Edge

Moving device toward the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**25**	**24**	**23**	**22**	**21**	**20**	**19**	**18**	**17**	**16**	**15**
Main antenna	Far	Far	Far	Far	Far	Near	Near	Near	Near	Near	Near

Moving device away from the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Main antenna	Near	Near	Near	Near	Near	Near	Far	Far	Far	Far	Far

Right Edge

Moving device toward the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**
Main antenna	Far	Far	Far	Far	Far	Near	Near	Near	Near	Near	Near

Moving device away from the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Main antenna	Near	Near	Near	Near	Near	Near	Far	Far	Far	Far	Far

ANT1:

Front Edge

Moving device toward the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**	**9**
Main antenna	Far	Far	Far	Far	Far	Near	Near	Near	Near	Near	Near

Moving device away from the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Main antenna	Near	Near	Near	Near	Near	Near	Far	Far	Far	Far	Far

Rear Edge

Moving device toward the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**28**	**27**	**26**	**25**	**24**	**23**	**22**	**21**	**20**	**19**	**18**
Main antenna	Far	Far	Far	Far	Far	Near	Near	Near	Near	Near	Near

Moving device away from the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**
Main antenna	Near	Near	Near	Near	Near	Near	Far	Far	Far	Far	Far

Bottom Edge

Moving device toward the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**25**	**24**	**23**	**22**	**21**	**20**	**19**	**18**	**17**	**16**	**15**
Main antenna	Far	Far	Far	Far	Far	Near	Near	Near	Near	Near	Near

Moving device away from the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Main antenna	Near	Near	Near	Near	Near	Near	Far	Far	Far	Far	Far

Left Edge

Moving device toward the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**26**	**25**	**24**	**23**	**22**	**21**	**20**	**19**	**18**	**17**	**16**
Main antenna	Far	Far	Far	Far	Far	Near	Near	Near	Near	Near	Near

Moving device away from the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**
Main antenna	Near	Near	Near	Near	Near	Near	Far	Far	Far	Far	Far

ANT3:

Front Edge

Moving device toward the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**
Main antenna	Far	Far	Far	Far	Far	Near	Near	Near	Near	Near	Near

Moving device away from the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Main antenna	Near	Near	Near	Near	Near	Near	Far	Far	Far	Far	Far

Rear Edge

Moving device toward the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**27**	**26**	**25**	**24**	**23**	**22**	**21**	**20**	**19**	**18**	**17**
Main antenna	Far	Far	Far	Far	Far	Near	Near	Near	Near	Near	Near

Moving device away from the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**
Main antenna	Near	Near	Near	Near	Near	Near	Far	Far	Far	Far	Far

Top Edge

Moving device toward the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**28**	**27**	**26**	**25**	**24**	**23**	**22**	**21**	**20**	**19**	**18**
Main antenna	Far	Far	Far	Far	Far	Near	Near	Near	Near	Near	Near

Moving device away from the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**
Main antenna	Near	Near	Near	Near	Near	Near	Far	Far	Far	Far	Far

Left Edge

Moving device toward the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**
Main antenna	Far	Far	Far	Far	Far	Near	Near	Near	Near	Near	Near

Moving device away from the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Main antenna	Near	Near	Near	Near	Near	Near	Far	Far	Far	Far	Far

ANT4/ANT5:

Front Edge

Moving device toward the phantom:

sensor near or far(KDB 616217 6.2.6)										
Distance [mm]	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**	**10**
Main antenna	Far	Far	Far	Far	Far	Near	Near	Near	Near	Near	Near

Moving device away from the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Main antenna	Near	Near	Near	Near	Near	Near	Far	Far	Far	Far	Far

Rear Edge

Moving device toward the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**25**	**24**	**23**	**22**	**21**	**20**	**19**	**18**	**17**	**16**	**15**
Main antenna	Far	Far	Far	Far	Far	Near	Near	Near	Near	Near	Near

Moving device away from the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Main antenna	Near	Near	Near	Near	Near	Near	Far	Far	Far	Far	Far

Top Edge

Moving device toward the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**30**	**29**	**28**	**27**	**26**	**25**	**24**	**23**	**22**	**21**	**20**
Main antenna	Far	Far	Far	Far	Far	Near	Near	Near	Near	Near	Near

Moving device away from the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Main antenna	Near	Near	Near	Near	Near	Near	Far	Far	Far	Far	Far

Right Edge

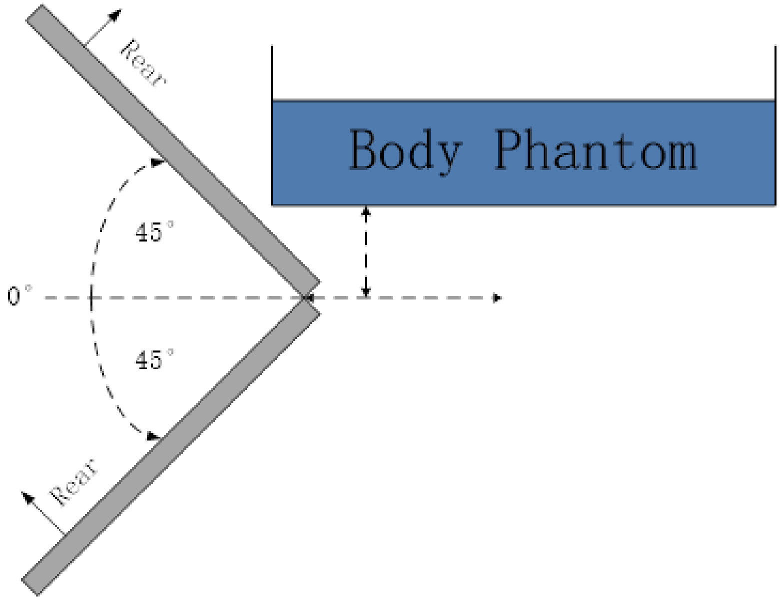
Moving device toward the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**21**	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**	**12**	**11**
Main antenna	Far	Far	Far	Far	Far	Near	Near	Near	Near	Near	Near

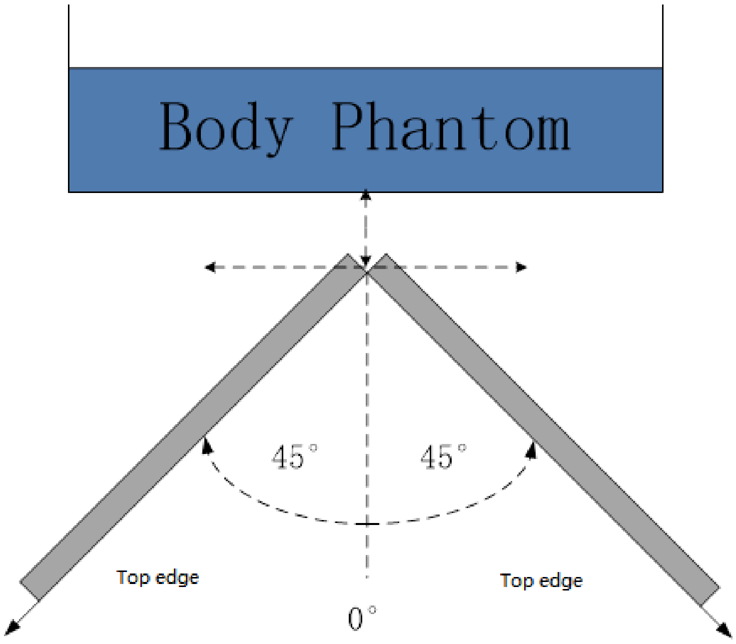
Moving device away from the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**
Main antenna	Near	Near	Near	Near	Near	Near	Far	Far	Far	Far	Far

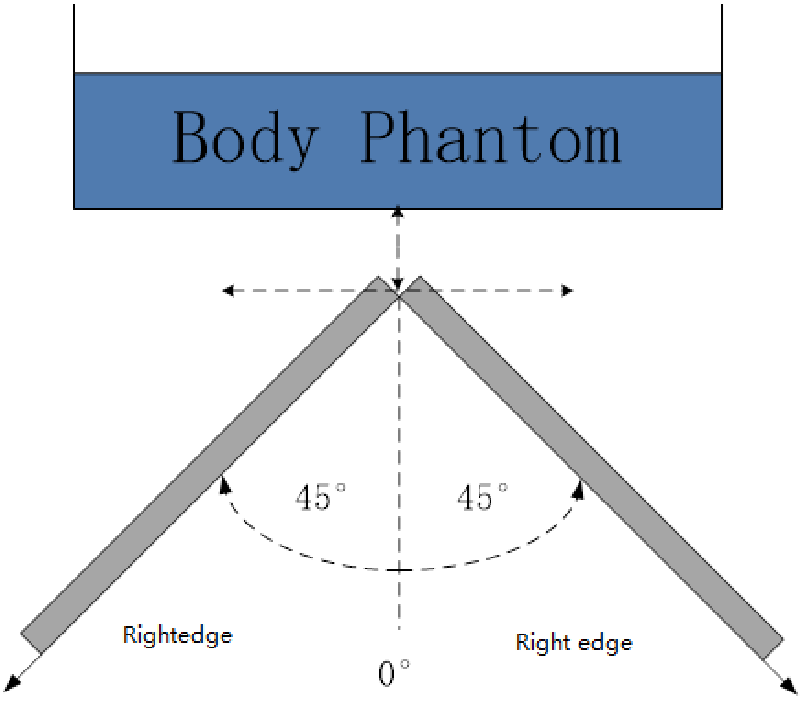
Per FCC KDB Publication 616217 D04v01r02, the influence of table tilt angles to proximity sensor triggering is determined by positioning each edge that contains a transmitting antenna, perpendicular to the flat phantom, at the smallest sensor triggering test distanceby rotating the device around the edge next to the phantom in ≤ 10° increments until the tablet is ±45° or more from the vertical position at 0°.



The front/rear edge evaluation



The bottom/top edge evaluation



The left/right edge evaluation

Based on the above evaluation, we come to the conclusion that the sensor triggering is not released and normal maximum output power is not restored within the ±45° range at the smallest sensor triggering test distance declared by manufacturer.

ANNEX J P-Sensor Triggering Data Summary

P-Sensor Trigger region

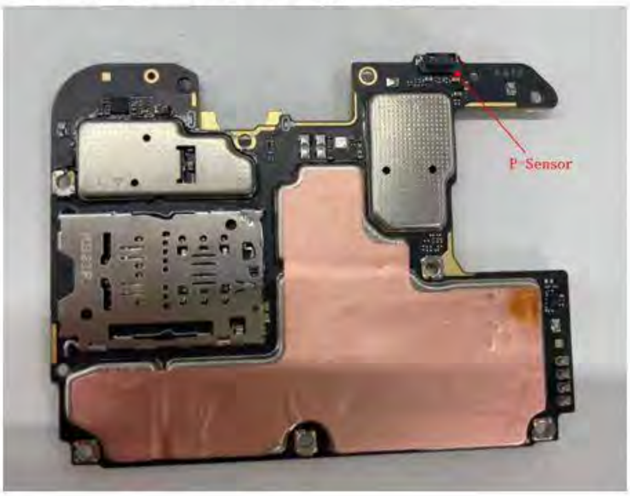
Receiver &P-sensor for Head SAR

1. The receiver works and the P-Sensor detects the object approaching （50mm）
2. The AP monitors the status changes of the handset and P-Sensor, and then performs interrupt processing with the defined keyValue
3. The upper layer according to the KeyValue, to execute (send AT instruction) to reduce/restore the antenna power.

Trigger area in yellow box

P-Sensor Trigger region

P-sensor is located on the front of the main board as shown in the figure. When the head is close during a voice call, the P-sensor is triggered.



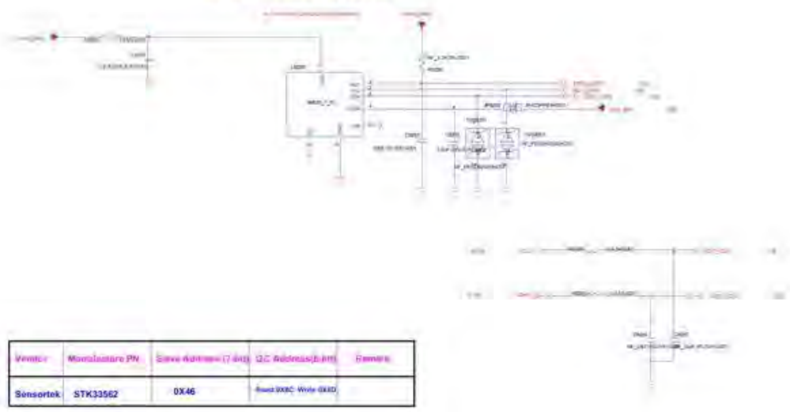
trigger distance 5cm

Front side

P-Sensor Working principle description

1. P-Sensor is to sense the effect of changing light, and give a judgment signal through the position of the mobile phone receiver near the head 50mm to reduce the antenna transmission power or restore the power.
2. Therefore, the function of P-Sensor SAR is only the position of the receiver on the front of the mobile phone, and it does not judge the close range of each antenna.

STK33562/STK33502



Vendor	Manufacturer PN	Slave Address (7 bit)	I2C Address(8 bit)	Remark
Sensortek	STK33562	0X46	Read 0X8C Write 0X8D	

Per FCC KDB Publication 616217 D04v01r02, this device was tested by the manufacturer to determine the proximity sensor triggering distances for the rear and bottom edge of the device. The measured output power within ±5mm of the triggering points (or until touching the phantom) is included for rear and each applicable edge.

To ensure all production units are compliant it is necessary to test SAR at a distance 1mm less than the smallest distance from the device and SAR phantom (determined from these triggering tests according to the KDB 616217 D04v01r02) with the device at maximum output power without power reduction. These SAR tests are included in addition to the SAR tests for the device touching the SAR phantom, with reduced power.

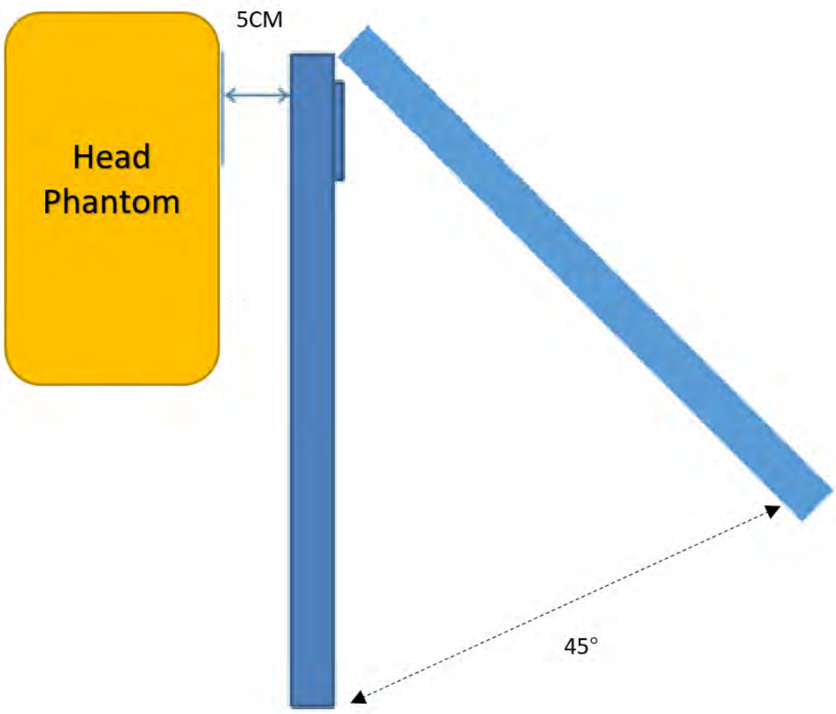
Front Edge

Moving device toward the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**55**	**54**	**53**	**52**	**51**	**50**	**49**	**48**	**47**	**48**	**47**
Main antenna	Far	Far	Far	Far	Far	Near	Near	Near	Near	Near	Near

Moving device away from the phantom:

sensor near or far(KDB 616217 6.2.6)											
Distance [mm]	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**
Main antenna	Near	Near	Near	Near	Near	Near	Far	Far	Far	Far	Far



The front edge evaluation

ANNEX K Accreditation Certificate

United States Department of Commerce
National Institute of Standards and Technology

NVLAP ®

ilac-MRA

Certificate of Accreditation to ISO/IEC 17025:2017

NVLAP LAB CODE: 600118-0

Telecommunication Technology Labs, CAICT
Beijing
China

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

Electromagnetic Compatibility & Telecommunications

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated January 2009).

DEPARTMENT OF COMMERCE · UNITED STATES OF AMERICA

2022-10-01 through 2023-09-30
Effective Dates

For the National Voluntary Laboratory Accreditation Program