

Page: 1 of 20

# **Appendix C**

## **Phantom Description**

Schmid & Partner Engineering AG

е a g

Zeughausstrasse 43, 8004 Zurich, Switzerland Phone +41 44 245 9700, Fax +41 44 245 9779 info@speag.com, http://www.speag.com

#### Certificate of Conformity / First Article Inspection

Item	Oval Flat Phantom ELI 5.0
Type No	QD OVA 002 A
Series No	1108 and higher
Manufacturer	Untersee Composites Knebelstrasse 8, CH-8268 Mannenbach, Switzerland

#### Tests

Complete tests were made on the prototype units QD OVA 001 A, pre-series units QD OVA 001 B as well as on some series units QD OVA 001 B. Some tests are made on all series units QD OVA 002 A.

Test	Requirement	Details	Units tested
Shape	Internal dimensions, depth and sagging are compatible with standards	Bottom elliptical 600 x 400 mm, Depth 190 mm, dimension compliant with [1] for f > 375 MHz	Prototypes
Material thickness	Bottom: 2.0mm +/- 0.2mm	dimension compliant with [3] for f > 800 MHz	all
Material parameters	rel. permittivity 2 – 5, loss tangent ≤ 0.05, at f ≤ 6 GHz	rel. permittivity 3.5 +/- 0.5 loss tangent ≤ 0.05	Material samples
Material resistivity	Compatibility with tissue simulating liquids .	Compatible with SPEAG liquids. **	Phantoms, Material sample
Sagging	Sagging of the flat section in tolerance when filled with tissue simulating liquid.	within tolerance for filling height up to 155 mm	Prototypes, samples

Note: Compatibility restrictions apply certain liquid components mentioned in the standard. containing e.g. DGBE, DGMHE or Triton X-100. Observe technical note on material compatibility

- [1] OET Bulletin 65, Supplement C, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields", Edition 01-01
   [2] IEEE 1528-2003, "Recommended Practice for Determining the Peak Spatial-Average Specific
- Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques, December 2003
- [3] IEC 62209-1 ed1.0, "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 1: Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close
- proximity to the ear (frequency range of 300 MHz to 3 GHz)", 2005-02-18
  [4] IEC 62209-2 ed1.0, "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 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)", 2010-03-30

#### Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of body-worn SAR measurements and system performance checks as specified in [1 - 4] and further standards.

25.7.2011

Signature / Stamp

Doc No 881 - QD OVA 002 A - A

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# System Validation from Original Equipment Supplier

Calibration Laboratory of

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





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

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

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

SGS Taoyuan City Certificate No. D6.5GHzV2-1006\_Aug23

#### CALIBRATION CERTIFICATE D6.5GHzV2 - SN:1006 Calibration procedure(s) Calibration Procedure for SAR Validation Sources between 3-10 GHz August 16, 2023 Calibration date: 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 $(22 \pm 3)^{\circ}$ C and humidity < 70%. Calibration Equipment used (M&TE critical for calibration) Cal Date (Certificate No.) Primary Standards Scheduled Calibration Power sensor R&S NRP33T SN: 100967 03-Apr-23 (No. 217-03806) Reference 20 dB Attenuator SN: BH9394 (20k) 30-Mar-23 (No. 217-03809) Mismatch combination SN: 84224 / 360D 03-Apr-23 (No. 217-03812) Apr-24 Reference Probe EX3DV4 12-Jun-23 (No. EX3-7405, Jun23) DAE4 SN: 908 03-Jul-23 (No. DAE4-908 Jul23) Jul-24 Secondary Standards Check Date (in house) Scheduled Check RF generator Anapico APSIN20G SN: 827 18-Dec-18 (in house check Dec-21) In house check: Dec-23 Power sensor NRP-Z23 SN: 100169 10-Jan-19 (in house check Nov-22) In house check: Nov-23 Power sensor NRP-18T SN: 100950 28-Sep-22 (in house check Nov-22) In house check: Nov-23 Network Analyzer Keysight E5063A SN:MY54504221 31-Oct-19 (in house check Oct-22) In house check: Oct-25 Function Calibrated by: Jeton Kastrati Approved by: Quality Manager Sven Kühn Issued: August 18, 2023

Certificate No: D6.5GHzV2-1006 Aug23

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### Calibration Laboratory of

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





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S Swiss Calibration Service

Accreditation No.: SCS 0108

Accredited by the Swiss Accreditation Service (SAS)

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#### Glossary:

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.

#### Additional Documentation:

b) 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 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 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 absorbed power density (APD): The absorbed power density is evaluated according to Samaras T, Christ A, Kuster N, "Compliance assessment of the epithelial or absorbed power density above 6 GHz using SAR measurement systems", Bioelectromagnetics, 2021 (submitted). The additional evaluation uncertainty of 0.55 dB (rectangular distribution) is considered.

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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54.4 W/kg ± 24.4 % (k=2)

#### **Measurement Conditions**

as far as not given on page 1

DASY Version	DASY6	V16.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	5 mm	with Spacer
Zoom Scan Resolution	dx, dy = 3.4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	6500 MHz ± 1 MHz	

#### Head TSL parameters

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	34.5	6.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	33.9 ± 6 %	6.03 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		<u></u>

#### SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	29.7 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	296 W/kg ± 24.7 % (k=2)
SAR averaged over 8 cm <sup>3</sup> (8 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.66 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	66.3 W/kg ± 24.4 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	100 mW input power	5.46 W/kg

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normalized to 1W

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SAR for nominal Head TSL parameters

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

#### Antenna Parameters with Head TSL

Impedance, transformed to feed point	45.6 Ω - 7.5 jΩ	
Return Loss	- 20.8 dB	

#### APD (Absorbed Power Density)

100 mW input power	
100 mvv input power	295 W/m <sup>2</sup>
normalized to 1W	2950 W/m <sup>2</sup> ± 29.2 % (k=2)
condition	
37.00.000	133 W/m²
Too mys input power	193 (4)11
	normalized to 1W  condition  100 mW input power

<sup>\*</sup>The reported APD values have been derived using the psSAR1g and psSAR8g.

#### General Antenna Parameters and Design

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

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

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

#### Additional EUT Data

SPEAG

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#### **DASY6 Validation Report for Head TSL**

Measurement Report for D6.5GHz-1006, UID 0 -, Channel 6500 (6500.0MHz)

2							
		. Toron			10.11		
	acturer				DUT Type	e	
D6.5GHz		10.0 x 10.0	x 10.0	N: 1006	1.0		
Exposure Cond	ditions						
Phantom	Position, Tes	t Band	Group,	Frequency	Conversion	TSL Cond.	TSL
Section, TSL	Distance		UID	[MHz]	Factor	[S/m]	Permittivity
	[mm]			97.277		605	24 200 000
Flat, HSL	5.00	Band	CW,	6500	5.50	6.03	33.9
Hardware Setu	un						
	-	TSI		Probe Cali	hration Date	DAF Calib	oration Date
	tor 1192		nnnve				
WIFF VO.0 CEIII	1102	HBBL000-10	000040	EX30V4 - 3	147403, 2023-00-12	DAL4 3113	08, 2023-07-03
Scan Setup				Measureme	ent Results		
			Zoom Sca	n			Zoom Scan
Grid Extents	[mm]		22.0 x 22.0 x 22.	0 Date		2	023-08-16, 11:16
Grid Steps [m	nm]		3.4 x 3.4 x 1.	4 psSAR1g[	W/Kg]		29.7
Sensor Surface	ce [mm]		1				6.66
Graded Grid	4,4,000		Ye				5.46
Grading Ratio	0		1.				-0.02
			N/				Disabled
	ction						31000100
Scan Method	1						No correction
	Name, Manufi D6.5GHz  Exposure Cone Phantom Section, TSL  Flat, HSL  Hardware Sett Phantom MFP V8.0 Cen  Scan Setup  Grid Extents Grid Steps [n Sensor Surfa Graded Grid Grading Ratic MAIA Surface Dete	D6.5GHz  Exposure Conditions Phantom Position, Tes Section, TSL Distance [mm] Flat, HSL 5.00  Hardware Setup Phantom MFP V8.0 Center - 1182  Scan Setup  Grid Extents [mm] Grid Steps [mm] Sensor Surface [mm] Graded Grid Gradeing Ratio	Name, Manufacturer D6.5GHz D0.5GHz D0.	Name, Manufacturer   Dimensions [mm]   I   10.0 x 10.0 x 10.0   S	Name, Manufacturer Dimensions [mm]         IMEI D6.5GHz           D6.5GHz         10.0 x 10.0 x 10.0         SN: 1006           Exposure Conditions           Phantom         Position, Test Distance UID [MHz]         Frequency [MHz]           Section, TSL Distance [mm]         UID [MHz]         6500           Hardware Setup Phantom         TSL Probe, Cali EX3DV4 - S         Probe, Cali EX3DV4 - S           MFP V8.0 Center − 1182         HBBL600-10000V6         EX3DV4 - S           Scan Setup         Measurem           Grid Extents [mm]         22.0 x 22.0 x 22.0         Date psshors furface [mm]         3.4 x 3.4 x 1.4         psSAR81g psshors Surface [mm]         1.4 psSAR8g pssAR10g	Name, Manufacturer D6.5GHz         Dimensions [mm] D1.00 x 10.0 x 10.0 x 10.0 SN: 1006         JUST 799. SN: 1006         DUT 799. SN: 1006<	Name, Manufacturer Dimensions [mm] IMEI         DUT Type           D6.5GHz         10.0 x 10.0 x 10.0 x 10.0         SN: 1006         -           Exposure Conditions           Phantom Position, Test Band Group, Frequency Conversion TSL Cond. [S/m]           [mm]         TSL Probe, Calibration Date EX3DV4 - SN7405, 2023-06-12         DAE4 Sn9           Scan Setup         Measurement Results           Zoom Scan Grid Extents [mm]         22.0 x 22.0 x 22.0 Date Date Date Date Date Date Date Date



M2/M1 [%]

Dist 3dB Peak [mm]

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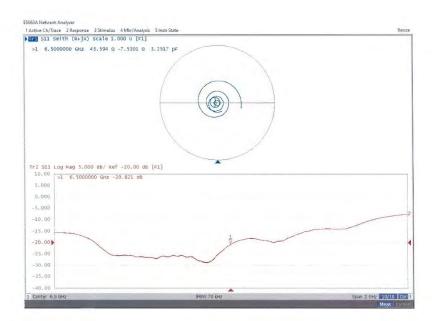
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#### Impedance Measurement Plot for Head TSL



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Certificate No. D7GHzV2-1007\_Aug23

	D7GHzV2 - SN:		
Calibration procedure(s)	QA CAL-22.v7 Calibration Proce	between 3-10 GHz	
Calibration date:	August 16, 2023		
The measurements and the uncerta	ainties with confidence p	ional standards, which realize the physical uni probability are given on the following pages and property: environment temperature (22 $\pm$ 3)°C	d are part of the certificate.
Primary Standards	ID#	Cal Date (Certificate No.)	Scheduled Calibration
Power sensor R&S NRP33T Reference 20 dB Attenuator Mismatch combination Reference Probe EX3DV4 DAE4	SN: 100967 SN: BH9394 (20k) SN: 84224 / 360D SN: 7405 SN: 908	03-Apr-23 (No. 217-03806) 30-Mar-23 (No. 217-03809) 03-Apr-23 (No. 217-03812) 12-Jun-23 (No. EX3-7405_Jun23) 03-Jul-23 (No. DAE4-908_Jul23)	Apr-24 Mar-24 Apr-24 Jun-24 Jul-24
Secondary Standards	ID#	Check Date (in house)	Scheduled Check
RF generator Anapico APSIN20G	SN: 827 SN: 100169 SN: 100950	18-Dec-18 (in house check Dec-21) 10-Jan-19 (in house check Nov-22)	In house check: Dec-23 In house check: Nov-23 In house check: Nov-23
Power sensor NRP-Z23 Power sensor NRP-18T Network Analyzer Keysight E5063A		28-Sep-22 (in house check Nov-22) 31-Oct-19 (in house check Oct-22)	In house check: Oct-25
Power sensor NRP-18T			

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Glossary:

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

### 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.

#### Additional Documentation:

b) 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 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
- 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.
- 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
- The absorbed power density (APD): The absorbed power density is evaluated according to Samaras T, Christ A, Kuster N, "Compliance assessment of the epithelial or absorbed power density above 6 GHz using SAR measurement systems". Bioelectromagnetics, 2021 (submitted). The additional evaluation uncertainty of 0.55 dB (rectangular distribution) is considered.

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: D7GHzV2-1007\_Aug23

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#### **Measurement Conditions**

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

DASY Version	DASY6	V16.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	5 mm	with Spacer
Zoom Scan Resolution	dx, $dy = 3.0$ mm, $dz = 1.2$ mm	Graded Ratio = 1.2 (Z direction)
Frequency	7000 MHz ± 1 MHz	, , , , , , , , , , , , , , , , , , , ,

#### Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	33.9	6.65 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	32.7 ± 6 %	6.66 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	7-0	-

#### SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	28.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	281 W/kg ± 24.7 % (k=2)

SAR averaged over 8 cm3 (8 g) of Head TSL	condition	
SAR measured	100 mW input power	6.12 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	60.7 W/kg ± 24.4 % (k=2)

SAR averaged over 10 cm3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	5.01 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	49.6 W/kg ± 24.4 % (k=2)

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#### Appendix

#### Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.3 Ω - 5.7 jΩ	
Return Loss	- 23.9 dB	

### APD (Absorbed Power Density)

APD averaged over 1 cm <sup>2</sup>	Condition		
APD measured	100 mW input power	281 W/m²	
APD measured	normalized to 1W	2810 W/m2 ± 29.2 % (k=2)	
APD averaged over 4 cm <sup>2</sup>	condition		
APD measured	100 mW input nower	400 \4/2	

APD measured normalized to 1W 1220 W/m2 ± 28.9 % (k=2) reported APD values have been derived using the psSAR1g and psSAR8g.

#### General Antenna Parameters and Design

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	
	·		
ificate No: D7GHzV2-1007_Aug23	Page 4 of 6		

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### DASY6 Validation Report for Head TSL

Measurement Report for D7GHz-1007, UID 0 -, Channel 7000 (7000.0MHz)

Name, Manuf	Test Properties acturer D	imensions	[mm] IN	1EI	DUT Typ	e	
D7GHz	1	.0.0 x 10.0	x 10.0 St	N: 1007	-		
Exposure Con	ditions						
Phantom	Position, Test	Band	Group,	Frequency	Conversion	TSL Cond.	TSL
Section, TSL	Distance [mm]		UID	[MHz]	Factor	[S/m]	Permittivity
Flat, HSL	5.00	Band	CW,	7000	5.80	6.66	32.7
Hardware Seti	up						
Phantom	TSI	L		Probe, Calil	bration Date	DAE Calib	oration Date
MFP V8.0 Cent	ter - 1182 HB	BL600-100	000V6		N7405, 2023-06-12		08, 2023-07-03
Scan Setup				Measureme	ent Results		
			Zoom Scan				Zoom Scan
Grid Extents			22.0 x 22.0 x 22.0	Date		20	023-08-16, 13:18
Grid Steps [m			3.0 x 3.0 x 1.2	psSAR1g [	N/Kg]		28.3
Sensor Surfac	ce [mm]		1.4	psSAR8g [\	N/Kg]		6.12
Graded Grid			Yes	psSAR10g	[W/Kg]		5.01
Grading Ratio	)		1.2	Power Drif			0.02
MAIA	and the same		N/A	Power Sca			Disabled
Surface Detec	011011		VMS + 6p	Scaling Fac	ctor [dB]		
Scan Method			Measured	TSL Correc			No correction
				NA7/NA1 TO/	1		



M2/M1 [%]

Dist 3dB Peak [mm]

Certificate No: D7GHzV2-1007\_Aug23

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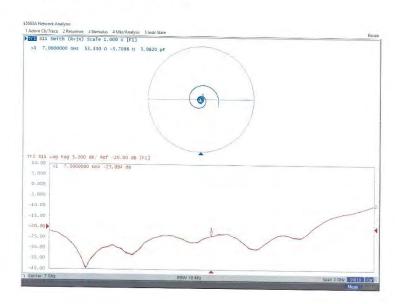
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#### Impedance Measurement Plot for Head TSL



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Accreditation No.: SCS 0108

Client SGS-TW (Auden)

Certificate No: 5G-Veri10-1021 Jan23

Object	5G Verification Source 10 GHz - SN: 1021						
Calibration procedure(s)	QA CAL-45.v4 Calibration pro	z					
Calibration date:	January 19, 2	023					
The measurements and the uncer	rtainties with confidence	national standards, which realize the physical units of the probability are given on the following pages and a ratory facility: environment temperature ( $22 \pm 3$ )°C are	re part of the certificate.				
Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration				
Reference Probe EUmmWV3 DAE4ip	SN: 9374 SN: 1602	2023-01-03(No. EUmmWV3-9374_Jan23) 2022-06-27 (No. DAE4ip-1602_Jun22)	Jan-24 Jun-23				
Secondary Standards	ID#	Check Date (in house)	Scheduled Check				
RF generator R&S SMF100A Power sensor R&S NRP18S-10	SN: 100184 SN: 101258	19-May-22 (in house check Nov-22) 31-May-22 (in house check Nov-22)	In house check: Nov-23 In house check: Nov-23				
	Name	Function	Signature				
calibrated by:	Name Leif Klysner	Function Laboratory Technician					
allibrated by:			Signature Saf Myn-				

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Glossary

CW

Continuous wave

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

- Internal procedure QA CAL-45, Calibration procedure for sources in air above 6 GHz.
- IEC/IEEE 63195-1, "Assessment of power density of human exposure to radio frequency fields from wireless devices in close proximity to the head and body (frequency range of 6 GHz to 300 GHz)", May 2022

#### Methods Applied and Interpretation of Parameters

- Coordinate System: z-axis in the waveguide horn boresight, x-axis is in the direction of the E-field, y-axis normal to the others in the field scanning plane parallel to the horn flare and horn flange.
- Measurement Conditions: (1) 10 GHz: The radiated power is the forward power to the horn antenna minus ohmic and mismatch loss. The forward power is measured prior and after the measurement with a power sensor. During the measurements, the horn is directly connected to the cable and the antenna ohmic and mismatch losses are determined by far-field measurements. (2) 30, 45, 60 and 90 GHz. The verification sources are switched on for at least 30 minutes. Absorbers are used around the probe cub and at the ceiling to minimize reflections
- Horn Positioning: The waveguide horn is mounted vertically on the flange of the waveguide source to allow vertical positioning of the EUmmW probe during the scan. The plane is parallel to the phantom surface. Probe distance is verified using mechanical gauges positioned on the flare of the horn.
- E- field distribution: E field is measured in two x-y-plane (10mm, 10mm + N4) with a vectorial E-field probe. The E-field value stated as calibration value represents the E-fieldmaxima and the averaged (1cm² and 4cm²) power density values at 10mm in front of the
- Field polarization: Above the open horn, linear polarization of the field is expected. This is verified graphically in the field representation.

#### Calibrated Quantity

Local peak E-field (V/m) and average of peak spatial components of the poynting vector  $(W/m^2)$  averaged over the surface area of 1 cm² and 4cm² at the nominal operational frequency of the verification source. Both square and circular averaging results are listed.

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 Version	DASY8 Module mmWaye	V3.2.2
Phantom	5G Phantom	
Distance Horn Aperture - plane	10 mm	
XY Scan Resolution	dx, dy = 7.5 mm	
Number of measured planes	2 (10mm, 10mm + \(\lambda\)4)	
Frequency	10 GHz ± 10 MHz	

#### Calibration Parameters, 10 GHz

Circular Averaging

Distance Horn Aperture to Measured Plane	Prad¹ (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Avg Power Density Avg (psPDn+, psPDtot+, psPDmod+) (W/m²)		Uncertainty (k = 2)
				1 cm <sup>2</sup>	4 cm <sup>2</sup>	
10 mm	86.1	152	1.27 dB	61.5	55.6	1.28 dB

Distance Horn Aperture to Measured Plane	Prad¹ (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Power Density psPDn+, psPDtot+, psPDmod+ (W/m²)		Uncertainty (k = 2)
				1 cm <sup>2</sup>	4 cm <sup>2</sup>	
10 mm	86.1	152	1.27 dB	61.4, 61.5, 61.6	55.4, 55.6, 55.9	1.28 dB

Distance Horn Aperture to Measured Plane	Prad¹ (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Avg Power Density  Avg (psPDn+, psPDtnot+, psPDmod+)  (W/m²)		Uncertainty (k = 2)
				1 cm <sup>2</sup>	4 cm <sup>2</sup>	
10 mm	86.1	152	1.27 dB	61.5	55.5	1.28 dB

Distance Horn Aperture to Measured Plane	Prad¹ (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Power Density psPDn+, psPDtot+, psPDmod+ (W/m²)		Uncertainty (k = 2)
				1 cm <sup>2</sup>	4 cm <sup>2</sup>	
10 mm	86.1	152	1.27 dB	61.4, 61.4, 61.6	55.3, 55.4, 55.8	1.28 dB

Max Power Density

Distance Horn Aperture to Measured Plane	Prad¹ (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Max Power Density Sn, Stot,  Stot  (W/m²)	Uncertainty (k = 2)
10 mm	86.1	152	1.27 dB	63.8, 63.9, 63.9	1.28 dB

Assessed ohmic and mismatch loss plus numerical offset; 0.55 dB

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61.4 61.5 61.6 63.8 63.9 63.9 152 0.00

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#### **DASY Report**

Measurement Report for 5G Verification Source 10 GHz, UID 0 -, Channel 10000 (10000.0MHz)

Device under Test Name, Manufacturer 5G Verification Source	Dimensions [m		IMEI SN: 1021	DUT Type	
Exposure Conditio Phantom Section	Position, Test Distance [mm]	Band	Group,	Frequency [MHz], Channel Number	Conversion Factor
5G -	10.0 mm	Validation band	cw	10000.0, 10000	1.0

Hardware Setup			
Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date
mmWave Phantom - 1002	Air	EUmmWV3 - SN9374_F1-55GHz, 2023-01-03	DAE4ip Sn1602, 2022-06-27

nriwave Phantom - 1002	Air	EUmmWV3 - SN9374_F1-55GHz, 2023-01-03	DAE4ip Sn1602, 2022-06-27
can Setup		Measurement Results	
Grid Extents [mm] Grid Steps [lambda] Sensor Surface [mm] MAIA	5 G Sca 120.0 x 120. 0.25 x 0.2 10. MAIA not use	0 Date	2023-01-1: Circular Av
		Max(Stot) [W/m²] Max([Stot]) [W/m²] E <sub>max</sub> [V/m] Power Drift [dB]	



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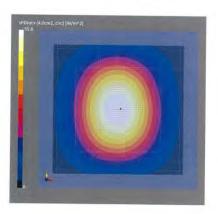


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#### **DASY Report**

Measurement Report for 5G Verification Source 10 GHz, UID 0 -, Channel 10000 (10000.0MHz)

Device under Test Pro					
Name, Manufacturer	Dimensions [mn		IMEI	DUT Type	
5G Verification Source 10 C	5Hz 100.0 x 100.0 x	172.0	SN: 1021		
<b>Exposure Conditions</b>					
Phantom Section	Position, Test Distance [mm]	Band	Group,	Frequency [MHz Channel Numbe	
5G -	10.0 mm	Validation band	cw	10000.0, 10000	1.0
Hardware Setup					
Phantom	Medium		Broke	, Calibration Date	was a service of the
mmWave Phantom - 1002	Air			nWV3 - SN9374_F1-55GHz,	DAE, Calibration Date DAE4ip Sn1602, 2022-06-27
Scan Setup			Mea	surement Results	
		5G S	can		5G Scan
Grid Extents [mm]		120.0 x 12	0.0 Date		2023-01-19, 16:42
Grid Steps [lambda]		0.25 x 0	.25 Avg.	Area [cm²]	4.00
Sensor Surface [mm] MAIA				Type	Circular Averaging
MAIA		MAIA not us		n+ [W/m²]	55.4
				tot+ [W/m²]	55.6
				mod+ [W/m²]	55.9
				(Sn) [W/m²]	63.8
				(Stot) [W/m²]	63.9
				( Stot ) [W/m²]	63.9
				[V/m] er Drift [dB]	152
			POW	er Drift [OB]	0.00



Certificate No: 5G-Veri10-1021\_Jan23

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Unless onerwise stated the results snown in this test report reter only to the sample(s) tested and such sample(s) are retained for 90 days only. We ## heat prosecuted to the fullest extent of the law.



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#### **DASY Report**

Measurement Report for 5G Verification Source 10 GHz, UID 0 -, Channel 10000 (10000.0MHz)

Device under Test P	roperties				
Name, Manufacturer	Dimensions [mm	1	IMEI	DUT Type	
5G Verification Source 10	GHz 100.0 x 100.0 x 1	172.0	SN: 1021	-	
<b>Exposure Conditions</b>	5				
Phantom Section	Position, Test Distance [mm]	Band	Group,	Frequency [MHz], Channel Number	Conversion Factor
5G -	10.0 mm	Validation band	cw	10000.0,	1.0
	Name, Manufacturer 5G Verification Source 10 Exposure Conditions Phantom Section	SG Verification Source 10 GHz 100.0 x 100.0 x 1  Exposure Conditions Phantom Section Position, Test Distance [mm]	Name, Manufacturer Dimensions [mm] 5G Verification Source 10 GHz 100.0 x 100.0 x 172.0  Exposure Conditions Phantom Section Position, Test Distance [mm]	Name, Manufacturer  5G Verification Source 10 GHz  Exposure Conditions Phantom Section Position, Test Distance Band Group, [mm]	Name, Manufacturer   Dimensions [mm]   IME  DUT Type   5G Verification Source 10 GHz   100.0 x 100.0 x 172.0   5N: 1021    Exposure Conditions   Position, Test Distance   Band   Group,   Frequency [MHz],   [mm]   Channel Number   Channel Number

Phantom mmWave Phantom - 1002	<b>Medium</b> Air	Probe, Calibration Date EUmmWV3 - SN9374_F1-55GHz, 2023-01-03	DAE, Calibration Date DAE4ip Sn1602, 2022-06-27
----------------------------------	----------------------	---	---

		2023-01-03	2022-06-27
Scan Setup		Measurement Results	
Grid Extents [mm] Grid Steps [lambda] Sensor Surface [mm] MAIA	SG Scan 120.0 x 120.0 0.25 x 0.25 10.0 MAIA not used	Date Avg. Area [cm²] Avg. Type psPDn+ [W/m²] psPDtot+ [W/m²] psPDtote [W/m²] Max[Stot] [W/m²] Max[Stot] [W/m²] Max[Stot] [W/m²] E <sub>ms</sub> [V/m] Power Drift [dB]	SG Scan 2023-01-19, 16-42 1.00 Square Averaging 61-4 61.6 63.8 63.9 63.9 152 0.00



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### **DASY Report**

Measurement Report for 5G Verification Source 10 GHz, UID 0 -, Channel 10000 (10000.0MHz)

Device under Test Pro Name, Manufacturer 5G Verification Source 10 G	Dimensions [mm		IMEI	DUT Type	
3G verification source 10 G	Hz 100.0 x 100.0 x 1	172.0	SN: 1021		
<b>Exposure Conditions</b>					
Phantom Section	Position, Test Distance [mm]	Band	Group,	Frequency [MHz], Channel Number	Conversion Factor
5G -	10.0 mm	Validation band	CW	10000.0, 10000	1.0
Hardware Setup					
Phantom	Medium		Probe, Calibra		DAE, Calibration Date
mmWave Phantom - 1002	Air		EUmmWV3 - 5 2023-01-03	SN9374_F1-55GHz,	DAE4ip Sn1602, 2022-06-27

Scan Setup Grid Extents [mm] Grid Steps [lambda] Sensor Surface [mm] MAIA

120.0 x 120.0 0.25 x 0.25 10.0

MAIA not used

Measurement Results

Date
Avg. Area [cm²]
Avg. Type
psPDn+ [W/m²]
psPDtot+ [W/m²]
psPDtot+ [W/m²]
Max(Sn) [W/m²]
Max(Stot) [W/m²]
Max[Stot) [W/m²]
Power Drift [dB]

DAE, Calibration Date DAE4ip Sn1602, 2022-06-27

> 2023-01-19, 16:42 4.00

4.00 Square Averaging 55.3 55.4 55.8 63.8 63.9



Certificate No: 5G-Veri10-1021\_Jan23

# - End of report -

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