

Appendix C

Phantom Description

Schmid & Partner Engineering AG

е а s р g

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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.

Standards

- [1] OET Bulletin 65, Supplement C, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields[®], Edition 01-01 IEEE 1528-2003, "Recommended Practice for Determining the Peak Spatial-Average Specific
- [2] 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 ed 10, "Human exposure to radio frequency fields from hard-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.

Date



Signature / Stamp

Schmid & Partner-Engineering/AG Zeugbarestrasse 43, 8004 Zeich, Smithiand Phone/441 44/255 9708, Few-444 64 44 59779

Doc No 881 - QD OVA 002 A - A

25.7.2011

1 (1) Page

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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System Validation from Original Equipment Supplier

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ccredited by the Swiss Accreditati			ccreditation No.: SCS 0108
he Swiss Accreditation Service Iultilateral Agreement for the red			
	5		DC 5011-1/0 1000 Aug
Client SGS (Auden)		Certificate No	: D6.5GHzV2-1006_Aug
CALIBRATION C	EDTIFICATE		
GALIDHATION C	ENTIFICATE		
	DC COLLEVIO CN	14000	
Object	D6.5GHzV2 - SN	1:1006	
Calibration procedure(s)	QA CAL-22.v6		
	Calibration Proce	edure for SAR Validation Sources	between 3-10 GHz
Calibration date:	August 26, 2021		
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Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

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Report No. : TESA2207000199ES Rev:

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Calibration Laboratory of Schmid & Partner Engineering AG aughausstrasse 43, 8004 Zurich, Switzerland 70



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

Swiss Calibration Service Accreditation No.: SCS 0108

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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 ConvF

N/A

tissue simulating liquid sensitivity in TSL / NORM x,y,z 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 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 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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Measurement Conditions

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

DASY Version	DASY6	V16.0
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

The following parameters and calculations were applied.

	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	33.6 ± 6 %	6.11 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	29.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	291 W/kg ± 24.7 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	in a second s	
annatoragoa ator to one (10 g) of field 15L	condition	
SAR measured	100 mW input power	5.39 W/kg

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	45.7 Ω - 6.6 jΩ	
Return Loss	- 21.7 dB	

APD (Absorbed Power Density)

APD averaged over 1 cm ²	Condition	
APD measured	100 mW input power	291 W/m ²
APD measured	normalized to 1W	2910 W/m ² ± 29.2 % (k=2)
APD averaged over 4 cm ²	condition	
		1001411 2
APD measured	100 mW input power	132 W/m ²

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-forcited 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

CLASS OF STREET, CLASS	
Manufactured by	SPEAG

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DASY6 Validation Report for Head TSL

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

Device under	Test Properties						
Name, Manufa	acturer I	Dimensions	[mm] IN	1EI	DUT Typ	e	
D6.5GHz		16.0 x 6.0 x	300.0 SN	1: 1006			
Exposure Cond	ditions						
Phantom	Position, Test	t Band	Group,	Frequency	Conversion	TSL Cond.	TSL
Section, TSL	Distance [mm]		UID	[MHz]	Factor	[S/m]	Permittivity
Flat, HSL	5.00	Band	CW,	6500	5.75	6.11	33.6
Hardware Setu	up						
Phantom		TSL		Probe, Calil	bration Date	DAE, Calib	ration Date
MFP V8.0 Cent	ter - 1182	HBBL600-10	000V6		N7405, 2020-12-30		08, 2021-06-24
Scan Setup				Measureme	ent Results		
			Zoom Scan				Zoom Scan
Grid Extents [22.0 x 22.0 x 22.0	Date		2	021-08-26, 10:54
Grid Steps [m			3.4 x 3.4 x 1.4	psSAR1g [W/Kg]		29.3
Sensor Surfac	ce [mm]		1.4	psSAR10g	[W/Kg]		5.39
Graded Grid			Yes	Power Drit	ft [dB]		0.03
Grading Ratio	0		1.4	Power Sca	ling		Disabled
MAIA			N/A	Scaling Fac	ctor [dB]		
Surface Detec			VMS + 6p	TSL Correc	tion		No correction
Scan Method			Measured	M2/M1 [%	5]		50.3
				Dist 3dB P	eak [mm]		4.8



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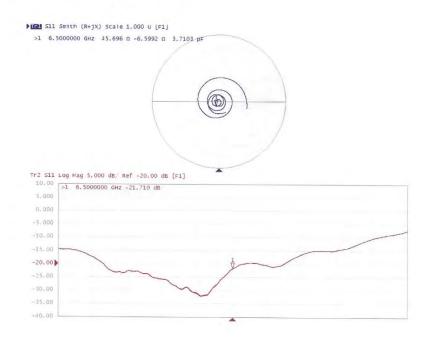
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Impedance Measurement Plot for Head TSL



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CALIBRATION CERTIFICATE Diject D7GHzV2 - SN:1007 Calibration procedure(s) QA CAL-22.v6 Calibration Procedure for SAR Validation Sources between 3-10 GHz Calibration date: August 26, 2021 This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (si). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate. All calibration Equipment used (M&TE critical for calibration) Scheduled Calibration Prover meter NRP D* Cal Date (Certificate No.) Scheduled Calibration Prover sensor NRP-291 SN: 10375 09-Apr-21 (No. 217-03291) Apr-22 Prover sensor NRP-291 SN: 103245 09-Apr-21 (No. 217-03291) Apr-22 Prover sensor NRP-291 SN: 103245 09-Apr-21 (No. 217-03292) Apr-22 Prover sensor NRP-291 SN: 103245 09-Apr-21 (No. 217-03293) Apr-22 Prover sensor NRP-291 SN: 103245 09-Apr-21 (No. 217-03292) Apr-22 Prover sensor NRP-291 SN: 103245 09-Apr-21 (No. 217-03293) Apr-22 Strie of Battenuator SN: Bri9394 (200) 09-Apr-21 (No. 217-0324) Apr-22 Strie of Battenuator SN: Bri93				
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Type-N mismatch combination Reference Probe EX3DV4 SN: 310982 / 06327 09-Apr-21 (No. 217-03344) Apr-22 SN: 7405 30-Dec-20 (No. EX3-7405_Dec20) Dec-21 SN: 908 24-Jun-21 (No. DAE4-908_Jun21) Jun-22 Secondary Standards ID # Check Date (in house) Scheduled Check RF generator Anapico APSIN20G Network Analyzer R&S ZVL13 SN: 669 28-Mar-17 (in house check Dec-18) In house check: Dec-21 SN: 101093 10-May-12 (in house check Dec-18) In house check: Dec-21 In house check: Dec-21 Calibrated by: Name Function Signature	The measurements and the uncert All calibrations have been conduct Calibration Equipment used (M&Tf Primary Standards Power meter NRP Power sensor NRP-Z91 Power sensor NRP-Z91	ainties with confidence p ed in the closed laborator E critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245	robability are given on the following pages ar ry facility: environment temperature (22 ± 3)°(<u>Cal Date (Certificate No.)</u> 09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292)	C and humidity < 70%. Scheduled Calibration Apr-22 Apr-22 Apr-22
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DAE4 SN: 908 24-Jun-21 (No. DAE4-908_Jun21) Jun-22 Secondary Standards ID # Check Date (in house) Scheduled Check RF generator Anapico APSIN20G Network Analyzer R&S ZVL13 SN: 669 28-Mar-17 (in house check Dec-18) In house check: Dec-21 Network Analyzer R&S ZVL13 SN: 101093 10-May-12 (in house check Dec-18) In house check: Dec-21 Calibrated by: Name Function Signature	The measurements and the uncert All calibrations have been conduct Calibration Equipment used (M&TE Primary Standards Power sensor NRP-291 Power sensor NRP-291 Power sensor NRP-291 Power sensor NRP-33T Reference 20 dB Attenuator	ainties with confidence p ed in the closed laborator E critical for calibration) ID # SN: 104778 SN: 103244 SN: 103244 SN: 103245 SN: 103967 SN: BH9394 (20k)	Cal Date (Certificate No.) 09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03292) 08-Apr-21 (No. 217-03293) 09-Apr-21 (No. 217-03293) 09-Apr-21 (No. 217-03293)	C and humidity < 70%. Scheduled Calibration Apr-22 Apr-22 Apr-22 Apr-22 Apr-22
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Approved by: Kalja Pokovic Technical Manager	The measurements and the uncert All calibrations have been conduct Calibration Equipment used (M&TE Primary Standards Power meter NRP Power sensor NRP-291 Power sensor NRP-291 Power sensor NRP-291 Power sensor NRP-291 Power sensor NRP-373 Reference 20 dB Attenuator Type-N mismatch combination Reference Probe EX3DV4 DAE4 Secondary Standards RF generator Anapico APSIN20G Network Analyzer R&S ZVL13	ainties with confidence p ed in the closed laborator E critical for calibration) ID # SN: 104778 SN: 103244 SN: 103245 SN: 103245 SN: 103967 SN: 103967 SN: 310982 / 06327 SN: 310982 / 06327 SN: 7405 SN: 308 ID # SN: 669 SN: 101093 Name	robability are given on the following pages ar ry facility: environment temperature (22 ± 3)°(09-Apr-21 (No. 217-03291/03292) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03291) 09-Apr-21 (No. 217-03293) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03343) 09-Apr-21 (No. 217-03344) 30-Dec-20 (No. EX3-7405_Dec20) 24-Jun-21 (No. DAE4-908_Jun21) Check Date (in house) 28-Mar-17 (in house check Dec-18) 10-May-12 (in house check Dec-18)	C and humidity < 70%. Scheduled Calibration Apr-22 Apr-22 Apr-22 Apr-22 Apr-22 Apr-22 Dec-21 Jun-22 Scheduled Check In house check: Dec-21 In house check: Dec-21
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Calibration Laboratory of Schmid & Partner Engineering AG eughausstrasse 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) 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 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 0 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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Measurement Conditions

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

DASY Version	DASY6	V16.0	
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	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 %	6.71 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	معتدر	

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	27.7 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	275 W/kg ± 24.7 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR averaged over 10 cm ³ (10 g) of Head TSL SAR measured	condition 100 mW input power	4.78 W/kg

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.9 Ω - 3.8 jΩ	
Return Loss	- 26.6 dB	

APD (Absorbed Power Density)

APD averaged over 1 cm ²	Condition	
APD measured	100 mW input power	274 W/m ²
APD measured	normalized to 1W	2740 W/m ² ± 29.2 % (k=2)
APD averaged over 4 cm ²	condition	
APD measured	100 mW input power	119 W/m ²
	normalized to 1W	1190 W/m ² ± 28.9 % (k=2)

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	1

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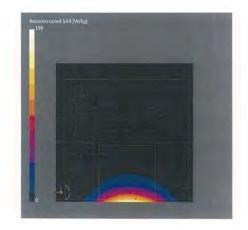


DASY6 Validation Report for Head TSL

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

Device under Test Properties

Name, Manufa	acturer D	imensions	[mm] IM	EI	DUT Typ	e	
D7GHz		14.0 x 6.0 x	297.0 SN	: 1007	*		
Exposure Cond	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	6.09	6.71	32.7
Hardware Setu Phantom		TSL		Probe. Calil	bration Date	DAE, Calik	pration Date
MFP V8.0 Cent		HBBL600-10	000V6		N7405, 2020-12-30		08, 2021-06-24
Scan Setup				Measureme	ent Results		
			Zoom Scan				Zoom Sca
Grid Extents	[mm]		22.0 x 22.0 x 22.0	Date		2	021-08-26, 14:1
Grid Steps [m	nm]		3.0 x 3.0 x 1.4	psSAR1g [W/Kg]		27.
Sensor Surfac	ce [mm]		1.4	psSAR10g	[W/Kg]		4.7
Graded Grid			Yes	Power Dri	ft [dB]		0.0
Grading Ratio	0		1.4	Power Sca	ling		Disable
MAIA			N/A	Scaling Fai	ctor [dB]		
Surface Dete	ction		VMS + 6p	TSL Correc	tion		No correctio
Scan Method	0		Measured	M2/M1 [%	6]		46.
				Dist 3dB P	eak [mm]		4.



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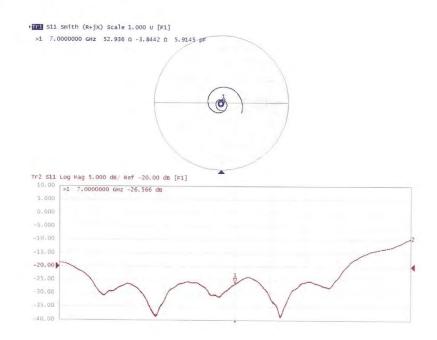
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Impedance Measurement Plot for Head TSL



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ccredited by the Swiss Accredit he Swiss Accreditation Service			editation No.: SCS 0108
Iultilateral Agreement for the			
Client SGS (Auden)		Certificate No: 5	G-Veri10-1021_Jan22
CALIBRATION	CEDTIEIC	TE	
CALIDRATION	GENTIFICA	ATE	
Object	5G Verificatio	on Source 10 GHz - SN: 1021	
Calibration procedure(s)	QA CAL-45.v		
	Calibration pr	rocedure for sources in air above 6 GH;	z
Calibration date:	January 24, 2	2022	
Calibration date:	January 24, 2	2022	
		nce probability are given on the following pages and a	re pair of the certificate.
All calibrations have been condu	ucted in the closed labo	pratory facility: environment temperature (22 \pm 3)°C ar	
All calibrations have been condu Calibration Equipment used (M8 Primary Standards	ucted in the closed labo TE critical for calibration ID #	oratory facility: environment temperature (22 ± 3)°C ar on) Cal Date (Certificate No.)	nd humidity < 70%. Scheduled Calibration
All calibrations have been condu Calibration Equipment used (M8 Primary Standards Reference Probe EUmmWV3	ucted in the closed labo	oratory facility: environment temperature (22 ± 3)°C ar on) Cal Date (Certificate No.) 2021-12-21(No. EUmmWV3-9374_Dec21)	nd humidity < 70%. Scheduled Calibration Dec-22
All calibrations have been condu Calibration Equipment used (M8 Primary Standards Reference Probe EUmmWV3	Lucted in the closed laboration TE critical for calibration ID # SN: 9374	oratory facility: environment temperature (22 ± 3)°C ar on) Cal Date (Certificate No.)	nd humidity < 70%. Scheduled Calibration
All calibrations have been condu Calibration Equipment used (M& Primary Standards Reference Probe EUmmWV3 DAE4ip	Lucted in the closed laboration TE critical for calibration ID # SN: 9374	oratory facility: environment temperature (22 ± 3)°C ar on) Cal Date (Certificate No.) 2021-12-21(No. EUmmWV3-9374_Dec21)	nd humidity < 70%. Scheduled Calibration Dec-22
All calibrations have been condu Calibration Equipment used (M& Primary Standards Reference Probe EUmmWV3 DAE4ip	ATE critical for calibration ID # SN: 9374 SN: 1602	oratory facility: environment temperature (22 ± 3)°C ar on) Cal Date (Certificate No.) 2021-12-21(No. EUmmWV3-9374_Dec21) 2021-06-25 (No. DAE4ip-1602_Jun21)	nd humidity < 70%. Scheduled Calibration Dec-22 Jun-22
All calibrations have been condu Calibration Equipment used (M& Primary Standards Reference Probe EUmmWV3 DAE4ip	ATE critical for calibration ID # SN: 9374 SN: 1602	oratory facility: environment temperature (22 ± 3)°C ar on) Cal Date (Certificate No.) 2021-12-21(No. EUmmWV3-9374_Dec21) 2021-06-25 (No. DAE4ip-1602_Jun21)	nd humidity < 70%. Scheduled Calibration Dec-22 Jun-22
All calibrations have been condu Calibration Equipment used (M& Primary Standards Reference Probe EUmmWV3 DAE4ip	ATE critical for calibration ID # SN: 9374 SN: 1602	oratory facility: environment temperature (22 ± 3)°C ar on) Cal Date (Certificate No.) 2021-12-21(No. EUmmWV3-9374_Dec21) 2021-06-25 (No. DAE4ip-1602_Jun21)	nd humidity < 70%. Scheduled Calibration Dec-22 Jun-22
All calibrations have been condu Calibration Equipment used (M& Primary Standards Reference Probe EUmmWV3 DAE4ip	ATE critical for calibration ID # SN: 9374 SN: 1602	oratory facility: environment temperature (22 ± 3)°C ar on) Cal Date (Certificate No.) 2021-12-21(No. EUmmWV3-9374_Dec21) 2021-06-25 (No. DAE4ip-1602_Jun21)	nd humidity < 70%. Scheduled Calibration Dec-22 Jun-22
All calibrations have been condu Calibration Equipment used (M& Primary Standards Reference Probe EUmmWV3 DAE4ip	ATE critical for calibration ID # SN: 9374 SN: 1602	oratory facility: environment temperature (22 ± 3)°C ar on) Cal Date (Certificate No.) 2021-12-21(No. EUmmWV3-9374_Dec21) 2021-06-25 (No. DAE4ip-1602_Jun21)	nd humidity < 70%. Scheduled Calibration Dec-22 Jun-22
All calibrations have been condu Calibration Equipment used (M& Primary Standards Reference Probe EUmmWV3 DAE4ip	ATE critical for calibration ID # SN: 9374 SN: 1602	oratory facility: environment temperature (22 ± 3)°C ar on) Cal Date (Certificate No.) 2021-12-21(No. EUmmWV3-9374_Dec21) 2021-06-25 (No. DAE4ip-1602_Jun21)	nd humidity < 70%. Scheduled Calibration Dec-22 Jun-22
	ATE critical for calibration ID # SN: 9374 SN: 1602	oratory facility: environment temperature (22 ± 3)°C ar on) Cal Date (Certificate No.) 2021-12-21(No. EUmmWV3-9374_Dec21) 2021-06-25 (No. DAE4ip-1602_Jun21)	nd humidity < 70%. Scheduled Calibration Dec-22 Jun-22
All calibrations have been condu Calibration Equipment used (M8 <u>Primary Standards</u> Reference Probe EUmmWV3 DAE4ip Secondary Standards	Arte critical for calibration	oratory facility: environment temperature (22 ± 3)°C ar on) Cal Date (Certificate No.) 2021-12-21(No. EUmmWV3-9374_Dec21) 2021-06-25 (No. DAE4ip-1602_Jun21) Check Date (in house) Function	nd humidity < 70%. Scheduled Calibration Dec-22 Jun-22
All calibrations have been condu Calibration Equipment used (M8 <u>Primary Standards</u> Reference Probe EUmmWV3 DAE4!p Secondary Standards	Lucted in the closed labor KTE critical for calibration ID # SN: 9374 SN: 1602 ID # ID #	oratory facility: environment temperature (22 ± 3)°C ar on) Cal Date (Certificate No.) 2021-12-21(No. EUmmWV3-9374_Dec21) 2021-06-25 (No. DAE4ip-1602_Jun21) Check Date (in house)	nd humidity < 70%. Scheduled Calibration Dec-22 Jun-22 Scheduled Check
All calibrations have been condu Calibration Equipment used (M& <u>Primary Standards</u> Reference Probe EUmmWV3 DAE4ip Secondary Standards	Arte critical for calibration	oratory facility: environment temperature (22 ± 3)°C ar on) Cal Date (Certificate No.) 2021-12-21(No. EUmmWV3-9374_Dec21) 2021-06-25 (No. DAE4ip-1602_Jun21) Check Date (in house) Function	nd humidity < 70%. Scheduled Calibration Dec-22 Jun-22 Scheduled Check
All calibrations have been condu Calibration Equipment used (M& Primary Standards Reference Probe EUmmWV3 DAE4ip	Arte critical for calibration	oratory facility: environment temperature (22 ± 3)°C ar on) Cal Date (Certificate No.) 2021-12-21(No. EUmmWV3-9374_Dec21) 2021-06-25 (No. DAE4ip-1602_Jun21) Check Date (in house) Function	nd humidity < 70%. Scheduled Calibration Dec-22 Jun-22 Scheduled Check
All calibrations have been condu Calibration Equipment used (M& <u>Primary Standards</u> Reference Probe EUmmWV3 DAE4ip Secondary Standards	Auted in the closed labor ID # SN: 9374 SN: 1602 ID # ID # LiD # Name Leif Klysner	Cal Date (Certificate No.) Cal Date (Certificate No.) 2021-12-21(No. EUmmWV3-9374_Dec21) 2021-06-25 (No. DAE4ip-1602_Jun21) Check Date (in house) Function Laboratory Technician	nd humidity < 70%. Scheduled Calibration Dec-22 Jun-22 Scheduled Check

Certificate No: 5G-Veri10-1021_Jan22 Page 1 of 7

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Accreditation No.: SCS 0108

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CW Continuous wave

Calibration is Performed According to the Following Standards

- Internal procedure QA CAL-45-5Gsources
- IEC TR 63170 ED1, "Measurement procedure for the evaluation of power density related to human exposure to radio frequency fields from wireless communication devices operating between 6 GHz and 100 GHz", January 2018

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 farfield 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 + λ /4) 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/m²) 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	cDASY6 Module mmWave	V2.4
Phantom	5G Phantom	
Distance Horn Aperture - plane	10 mm	
XY Scan Resolution	dx, dy = 7.5 mm	
Number of measured planes	2 (10mm, 10mm + λ/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 (psPD psPD	er Density n+, psPDtot+, mod+) /m ²)	Uncertainty (k = 2)
		A	6	1 cm ²	4 cm ²	
10 mm	86.1	148	1.27 dB	55.2	51.7	1.28 dB

Square Averaging

Distance Horn Aperture to Measured Plane	Prad ¹ (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Avg (psPD psPD	er Density n+, psPDtot+, mod+) /m ²)	Uncertainty (k = 2)
				1 cm ²	4 cm ²	
10 mm	86.1	148	1.27 dB	55.2	51.5	1.28 dB

¹ Assessed ohmic and mismatch loss plus numerical offset: 0.55 dB

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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	Dimensions [mm	1	IMEI	DUTT	
				DUT Type	
5G Verification Source	10 GHz 100.0 x 100.0 x 1	172.0	SN: 1021	-	
Exposure Conditio	ins				
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

Hardware Setup

Medium Air mmWave Phantom - 1002

Scan Setup

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

5G Scar
120.0 x 120.0
0.25 x 0.25
10.0
MAIA not used

	EUmmWV3 - SN9374_F1-55GHz, 2021-12-21
	Measurement Results
n	

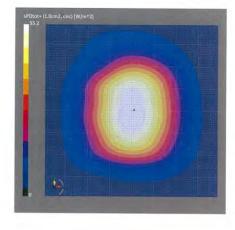
Probe, Calibration Date

Date Avg. Area [cm²] psPDn+ [W/m²] psPDtot+ [W/m²] psPDmod+ [W/m²] E_{max} [V/m] Power Drift [dB]

5G Scan 2022-01-24, 11:01 1.00 55.0 55.2 55.4 148 0.01

DAE, Calibration Date

DAE4ip Sn1602, 2021-06-25



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DASY Report

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

Name, Manufacturer	Dimensions [mm	1]	IMEI	DUT Type	
G Verification Source	10 GHz 100.0 x 100.0 x 1	172.0	SN: 1021		
xposure Conditio	ins				
Phantom Section	Position, Test Distance [mm]	Band	Group,	Frequency [MHz], Channel Number	Conversion Factor
G -	10.0 mm	Validation band	cw	10000.0, 10000	1.0

Hardware Setup Medium Probe, Calibration Date DAE, Calibration Date mmWave Phantom - 1002 Air EUmmWV3 - SN9374_F1-55GHz, DAE4ip Sn1602, 2021-06-25 2021-12-21

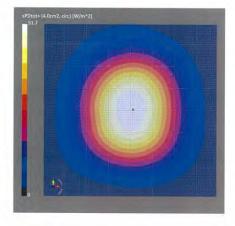
Scan Setup

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

5G Scan
120.0 x 120.0
0.25 x 0.25
10.0
MAIA not used

Measurement Results
Date
Avg. Area [cm ²]
psPDn+ [W/m ²]
psPDtot+ [W/m ²]
psPDmod+ [W/m ²]
Emax [V/m]
Power Drift [dB]

5G Scar 2022-01-24, 11:01 4.00 51.5 51.7 51.7 51.8 148 0.01



Certificate No: 5G-Veri10-1021_Jan22

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DASY Report

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

Device under Test	Properties				
Name, Manufacturer	Dimensions [mn	n]	IMEI	DUT Type	
5G Verification Source	10 GHz 100.0 x 100.0 x	172.0	SN: 1021		
Exposure Conditio	ns				
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

Medium Phantom mmWave Phantom - 1002 Air

Scan Setup

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

	5G Scar
	120.0 x 120.0
	0.25 x 0.25
	10.0
1	MAIA not used

EUmmWV3 - SN9374_F1-55GHz, 2021-12-21

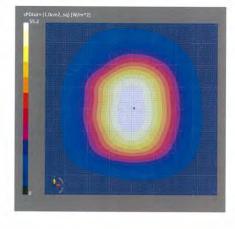
Probe, Calibration Date

DAE, Calibration Date DAE4ip Sn1602, 2021-06-25

Measurement Results

Date Avg. Area [cm²] psPDn+ [W/m²] psPDtot+ [W/m²] psPDmod+ [W/m²] E_{max} [V/m] Power Drift [dB]

5G Scan 2022-01-24, 11:01 1.00 55.0 55.2 55.4 148 0.01



Certificate No: 5G-Veri10-1021_Jan22

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5G Scar

4.00 51.3

51.5 51.7 148 0.01

2022-01-24, 11:01

DASY Report

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

Name, Manufacturer 5G Verification Source 1	Dimensions [mm .0 GHz 100.0 x 100.0 x 1	· · · · · · · · · · · · · · · · · · ·	IMEI SN: 1021	DUT Type	
Exposure Condition	ns				
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

Phantom	Medium	Probe, Calibration Date	DAE, Calibration Date	
mmWave Phantom - 1002	Air	EUmmWV3 - SN9374_F1-55GHz, 2021-12-21	DAE4ip Sn1602, 2021-06-25	

Measure

Scan Setup

Grid Extents [mm] Grid Steps [lambda] Sensor Surface [mm] ΜΔΙΔ

5G Scan
120.0 x 120.0
0.25 x 0.25
10.0
MAIA not used

Measurement Results	
Date	
Avg. Area [cm ²]	
psPDn+ [W/m ²]	
psPDtot+ [W/m ²]	
psPDmod+ [W/m ²]	
Emax [V/m]	
Power Drift [dB]	

4.0cm2, sq) [W/m			
	4 / 10		

Certificate No: 5G-Veri10-1021_Jan22 Page 7 of 7

- End of report -

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