CERTIFICATE OF CALIBRATION

ISSUED BY **UL INTERNATIONAL (UK) LTD**

DATE OF ISSUE: 07/Oct/2021 CERTIFICATE NUMBER : 14030223JD01F

5772

UL INTERNATIONAL (UK) LTD
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APPROVED SIGNATORY

.....

Naseer Mirza

Customer :
UL LLC
12 Laboratory Dr.
RTP, NC 27709 USA

Equipment Details:

Description:	Dipole Validation Kit	Date of Receipt:	04/Oct/2021
Manufacturer:	Speag		
Type/Model Number:	D2450V2		
Serial Number:	963		
Calibration Date:	06/Oct/2021		
Calibrated By:	Masood Khan Test Engineer		
Signature:	.....		

All Calibration have been conducted in the closed laboratory facility: Lab Temperature (22±3) ^{0}C and humidity < 70%

The calibration methods and procedures used were as detailed in:

1. **IEC 62209-1:2016**: 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)
2. **IEC 62209-2:2010:** 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)
3. **IEEE 1528: 2013:** IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communication Devices: Measurement Techniques
4. FCC KDB Publication Number**: "KDB865664 D01 SAR Measurement 100 MHz to 6 GHz"**
5. **DASY 6 System Handbook**
6. **Dipole Calibration Procedure V1.2:** Calibration performed as per internal procedure

The measuring equipment used to perform the calibration, documented in this certificate has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

UL No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
PRE0135115	Data Acquisition Electronics	SPEAG	DAE4	1438	12 Apr 2021	12
PRE0178314	Probe	SPEAG	EX3DV4	3995	16 Mar 2021	12
PRE0131865	Dipole	SPEAG	D2450V2	725	07 Oct 2020	12
PRE0151451	Power Monitoring Kit	Art-Fi	ART 100850-01	0001	Cal as part of System	-
PRE0151441	Power Sensor	Rhode & Schwarz	NRP8S	102481	22 Mar 2021	12
M2028	Vector Network Analyser	Keysight Technologies	E5071C	MY46521873	20 Jul 2021	12
M2029	Calibration Kit	Keysight Technologies	N4691B	MY46181255	02 Aug 2021	12
PRE0134063	Signal Generator	HP	8648C	3537A01598	03 Mar 2021	12
PRE0135028	Signal Generator	R&S	SME 06	831377/005	29 Mar 2021	12

SAR System Specification

Robot System Positioner:	Stäubli Unimation Corp. Robot Model: TX60L
Robot Serial Number:	F17/5ENYG1/A/01
DASY Version:	cDASY16.0.0.116
Phantom:	Flat section of SAM Twin Phantom
Distance Dipole Centre:	10 mm (with spacer)
Frequency:	2450 MHz

Dielectric Property Measurements – Head Simulating Liquid (HSL)

Simulant Liquid	Frequency (MHz)	Room Temp		Liquid Temp		Parameters	Target Value	Measured Value	Uncertainty (%)
		Start	End	Start	End				
Head	2450	21.3 ℃	20.8 ℃	21.0 ℃	20.6 ℃	**εr**	39.20	39.74	± 5%
						σ	1.80	1.82	± 5%

SAR Results – Head Simulating Liquid (HSL)

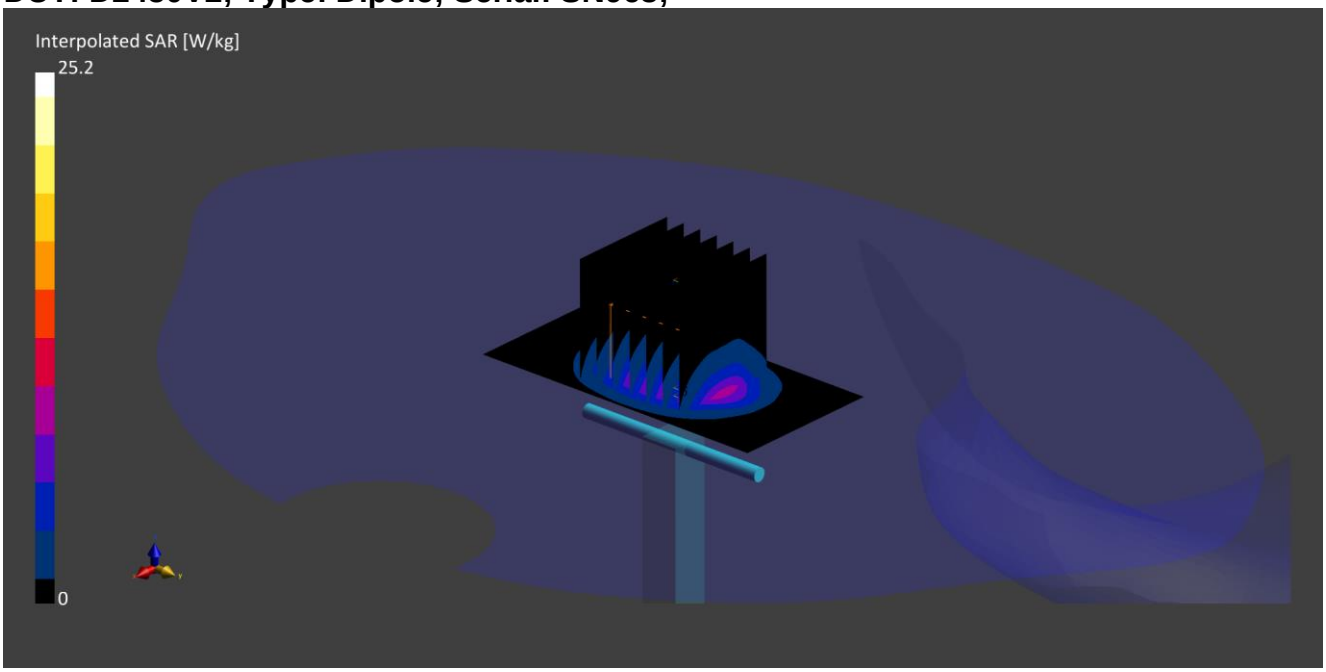
Simulant Liquid	SAR Measured	250 mW input Power	Normalised to 1.00 W	Uncertainty (%)
Head	SAR averaged over 1g	12.9 W/Kg	**51.36 W/Kg**	+16.80 / -16.43%
	SAR averaged over 10g	6.17 W/Kg	**24.56 W/Kg**	+16.72 / -16.42%

Antenna Parameters – Head Simulating Liquid (HSL)

Simulant Liquid	Parameter	Measured Level	Uncertainty (%)
Head	Impedance	48.70 0.29j Ω	± 3.01
	Return Loss	37.20	± 3.34

DASY Validation Scan for Head Stimulating Liquid (HSL)

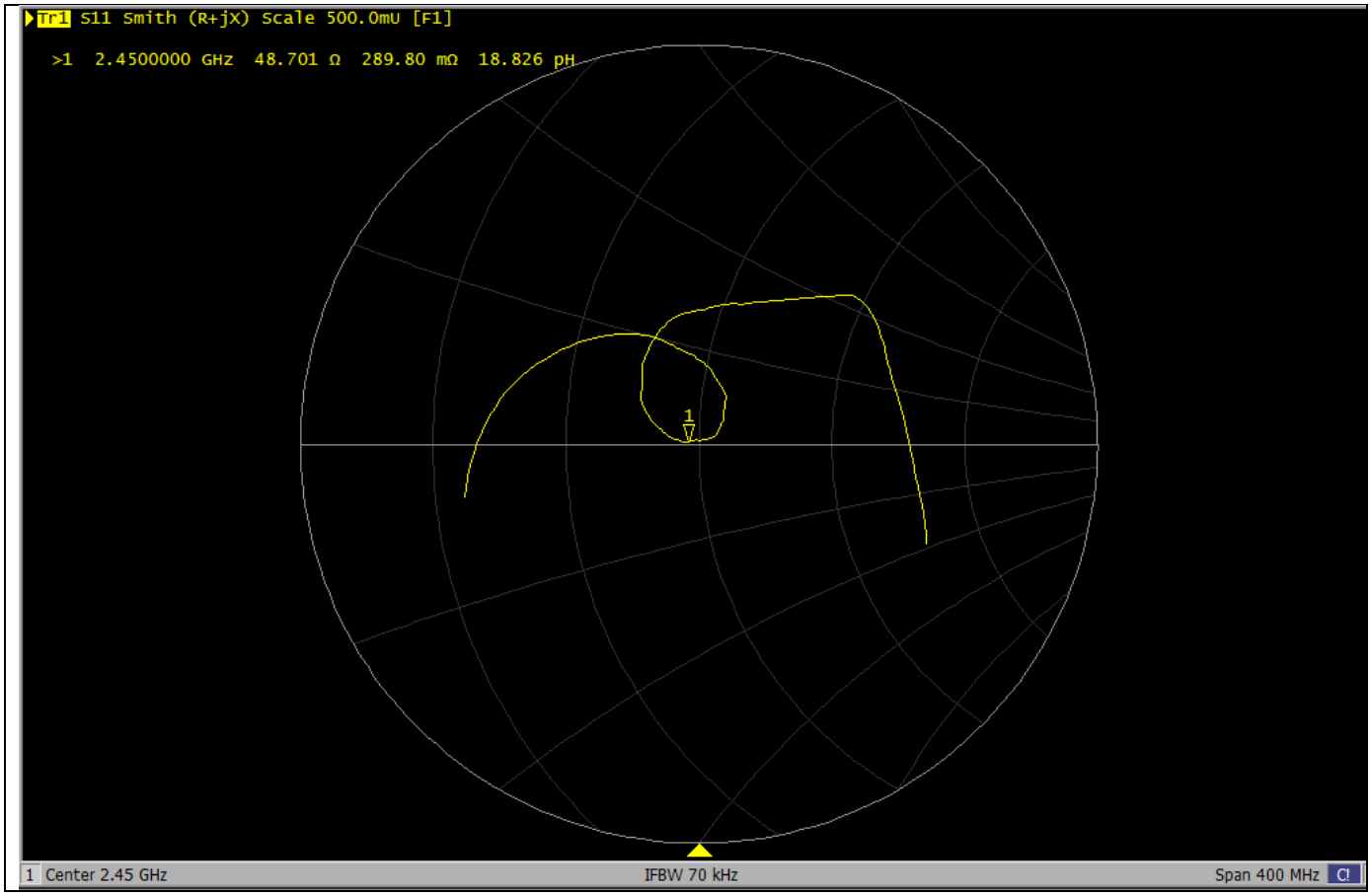
DUT: D2450V2; Type: Dipole; Serial: SN963;



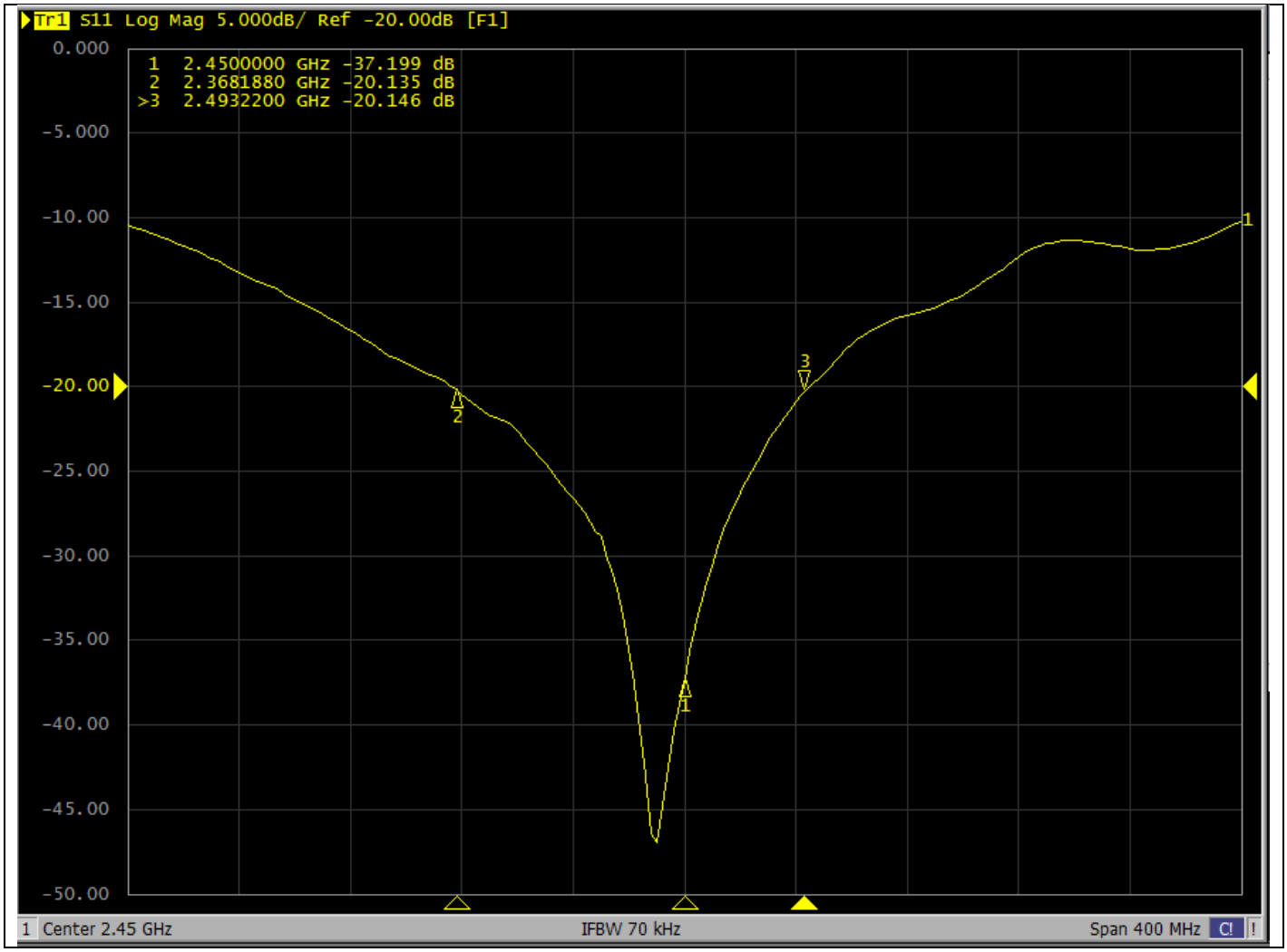
Communication System: CW UID: 0; Frequency: 2450.0 MHz; Duty Cycle: 1;
Medium: HSL; Site65_04Oct2021_115853_Head - 750 900 1750 2450 5250 5600 5750 5%;
Medium parameters used: f = 2450.0 MHz; σ = 1.83 S/m; ε_r = 39.7; ρ = 1000 kg/m3; $\Delta\varepsilon_r$ = 1.38 %; $\Delta\sigma$ = 1.62 %; No correction
Phantom section: Flat;
DASY 6 Configuration:
- Laboratory Name: Site65;
- Probe: EX3DV4 - SN7496; ConvF(7.84, 7.84, 7.84); Calibrated: 16 Mar 2021
- Sensor-Surface: 1.4 mm; VMS + 6p
- Electronics: DAE4 - SN1438; Calibrated: 12 Apr 2021
- Phantom: Twin-SAM V8.0 (30deg probe tilt); Serial: 1945
- Measurement SW: cDASY16.0.0.116

Area Scan (40x80): Interpolated grid: dx=10 mm, dy=10 mm
Zoom Scan1(30x30x30): Measurement grid: dx=5 mm, dy=5 mm, dz=1.5 mm; Grading Ratio: 1.5; Reference Value = 16.850 V/m; Power Drift = 0.01 dB
Minimum horizontal 3dB distance: 9.0 mm;
Vertical M2/M1 Ratio: 82.2 %;
SAR(1 g) = 12.900 W/kg; SAR(10 g) = 6.170 W/kg

Impedance Measurement Plot for Head Stimulating Liquid (HSL)



Return Loss Measurement Plot for Head Stimulating Liquid (HSL)



Calibration Certificate Label:

5772	**UL INTERNATIONAL (UK) LTD** **Tel: +44 (0) 1256312100** Certificate Number: 14030223JD01F Instrument ID: 963 Calibration Date: 06/Oct/2021 Calibration Due Date:

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CERTIFICATE OF CALIBRATION

ISSUED BY **UL INTERNATIONAL (UK) LTD**

DATE OF ISSUE: 14/Oct/2021 CERTIFICATE NUMBER : 14030223JD01G

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APPROVED SIGNATORY

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Naseer Mirza

Customer :
UL LLC
12 Laboratory Dr.
RTP, NC 27709 USA

Equipment Details:

Description:	Dipole Validation Kit	Date of Receipt:	04/Oct/2021
Manufacturer:	Speag		
Type/Model Number:	D5GHZV2		
Serial Number:	1213		
Calibration Date:	12/Oct/2021		
Calibrated By:	Masood Khan Test Engineer		
Signature:	.....		

All Calibration have been conducted in the closed laboratory facility: Lab Temperature (22±3) ^{0}C and humidity < 70%

The calibration methods and procedures used were as detailed in:

1. **IEC 62209-1:2016**: 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)
2. **IEC 62209-2:2010:** 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)
3. **IEEE 1528: 2013:** IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communication Devices: Measurement Techniques
4. FCC KDB Publication Number**: "KDB865664 D01 SAR Measurement 100 MHz to 6 GHz"**
5. **DASY 6 System Handbook**
6. **Dipole Calibration Procedure V1.2:** Calibration performed as per internal procedure

The measuring equipment used to perform the calibration, documented in this certificate has been calibrated in accordance with the manufacturers' recommendations, and is traceable to recognized national standards.

UL No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
PRE0135115	Data Acquisition Electronics	SPEAG	DAE4	1438	12 Apr 2021	12
PRE0178314	Probe	SPEAG	EX3DV4	3995	16 Mar 2021	12
PRE0178323	Dipole	SPEAG	D5GHzV2	1274	08 Mar 2021	12
PRE0151451	Power Monitoring Kit	Art-Fi	ART 100850-01	0001	Cal as part of System	-
PRE0151441	Power Sensor	Rhode & Schwarz	NRP8S	102481	22 Mar 2021	12
M2028	Vector Network Analyser	Keysight Technologies	E5071C	MY46521873	20 Jul 2021	12
M2029	Calibration Kit	Keysight Technologies	N4691B	MY46181255	02 Aug 2021	12
PRE0134063	Signal Generator	HP	8648C	3537A01598	03 Mar 2021	12
PRE0135028	Signal Generator	R&S	SME 06	831377/005	29 Mar 2021	12

SAR System Specification

Robot System Positioner:	Stäubli Unimation Corp. Robot Model: TX60L
Robot Serial Number:	F17/5ENYG1/A/01
DASY Version:	cDASY16.0.0.116
Phantom:	Flat section of SAM Twin Phantom
Distance Dipole Centre:	10 mm (with spacer)
Frequency:	5250 MHz

Dielectric Property Measurements – Head Simulating Liquid (HSL)

Simulant Liquid	Frequency (MHz)	Room Temp		Liquid Temp		Parameters	Target Value	Measured Value	Uncertainty (%)
		Start	End	Start	End				
Head	5250	21.4 ℃	20.9 ℃	21.2 ℃	20.6 ℃	**εr**	35.92	35.22	± 5%
						σ	4.71	4.56	± 5%

SAR Results – Head Simulating Liquid (HSL)

Simulant Liquid	SAR Measured	250 mW input Power	Normalised to 1.00 W	Uncertainty (%)
Head	SAR averaged over 1g	7.62 W/Kg	**76.20 W/Kg**	+16.77 / -16.70%
	SAR averaged over 10g	2.23 W/Kg	**22.30 W/Kg**	± 16.70%

Antenna Parameters – Head Simulating Liquid (HSL)

Simulant Liquid	Parameter	Measured Level	Uncertainty (%)
Head	Impedance	49.89 1.46j Ω	± 3.01
	Return Loss	36.68	± 3.34

SAR System Specification

Robot System Positioner:	Stäubli Unimation Corp. Robot Model: TX60L
Robot Serial Number:	F17/5ENYG1/A/01
DASY Version:	cDASY16.0.0.116
Phantom:	Flat section of SAM Twin Phantom
Distance Dipole Centre:	10 mm (with spacer)
Frequency:	5600 MHz

Dielectric Property Measurements – Head Simulating Liquid (HSL)

Simulant Liquid	Frequency (MHz)	Room Temp		Liquid Temp		Parameters	Target Value	Measured Value	Uncertainty (%)
		Start	End	Start	End				
Head	5600	21.4 ℃	21.1 ℃	21.2 ℃	20.8 ℃	**εr**	35.52	34.59	± 5%
						σ	5.06	4.95	± 5%

SAR Results – Head Simulating Liquid (HSL)

Simulant Liquid	SAR Measured	250 mW input Power	Normalised to 1.00 W	Uncertainty (%)
Head	SAR averaged over 1g	8.18 W/Kg	**81.80 W/Kg**	+16.77 / -16.70%
	SAR averaged over 10g	2.36 W/Kg	**23.60 W/Kg**	± 16.70%

Antenna Parameters – Head Simulating Liquid (HSL)

Simulant Liquid	Parameter	Measured Level	Uncertainty (%)
Head	Impedance	50.87 - 3.73j Ω	± 3.01
	Return Loss	28.42	± 2.97

SAR System Specification

Robot System Positioner:	Stäubli Unimation Corp. Robot Model: TX60L
Robot Serial Number:	F17/5ENYG1/A/01
DASY Version:	cDASY16.0.0.116
Phantom:	Flat section of SAM Twin Phantom
Distance Dipole Centre:	10 mm (with spacer)
Frequency:	5750 MHz

Dielectric Property Measurements – Head Simulating Liquid (HSL)

Simulant Liquid	Frequency (MHz)	Room Temp		Liquid Temp		Parameters	Target Value	Measured Value	Uncertainty (%)
		Start	End	Start	End				
Head	5750	21.5 ℃	21.1 ℃	21.3 ℃	21.0 ℃	**εr**	35.36	34.34	± 5%
						σ	5.22	5.13	± 5%

SAR Results – Head Simulating Liquid (HSL)

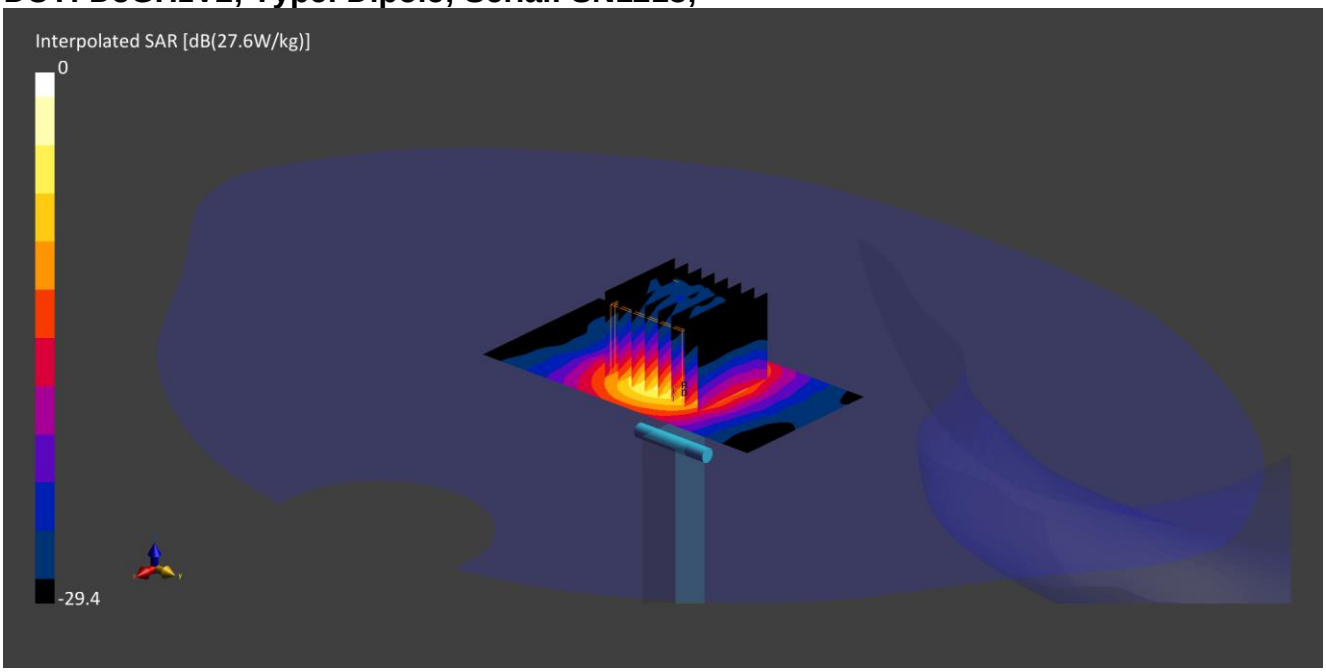
Simulant Liquid	SAR Measured	250 mW input Power	Normalised to 1.00 W	Uncertainty (%)
Head	SAR averaged over 1g	7.55 W/Kg	**75.50 W/Kg**	+16.77 / -16.70%
	SAR averaged over 10g	2.20 W/Kg	**22.00 W/Kg**	± 16.70%

Antenna Parameters – Head Simulating Liquid (HSL)

Simulant Liquid	Parameter	Measured Level	Uncertainty (%)
Head	Impedance	44.97 2.12j Ω	± 3.01
	Return Loss	24.82	± 2.93

DASY Validation Scan for Head Stimulating Liquid (HSL)

DUT: D5GHzV2; Type: Dipole; Serial: SN1213;

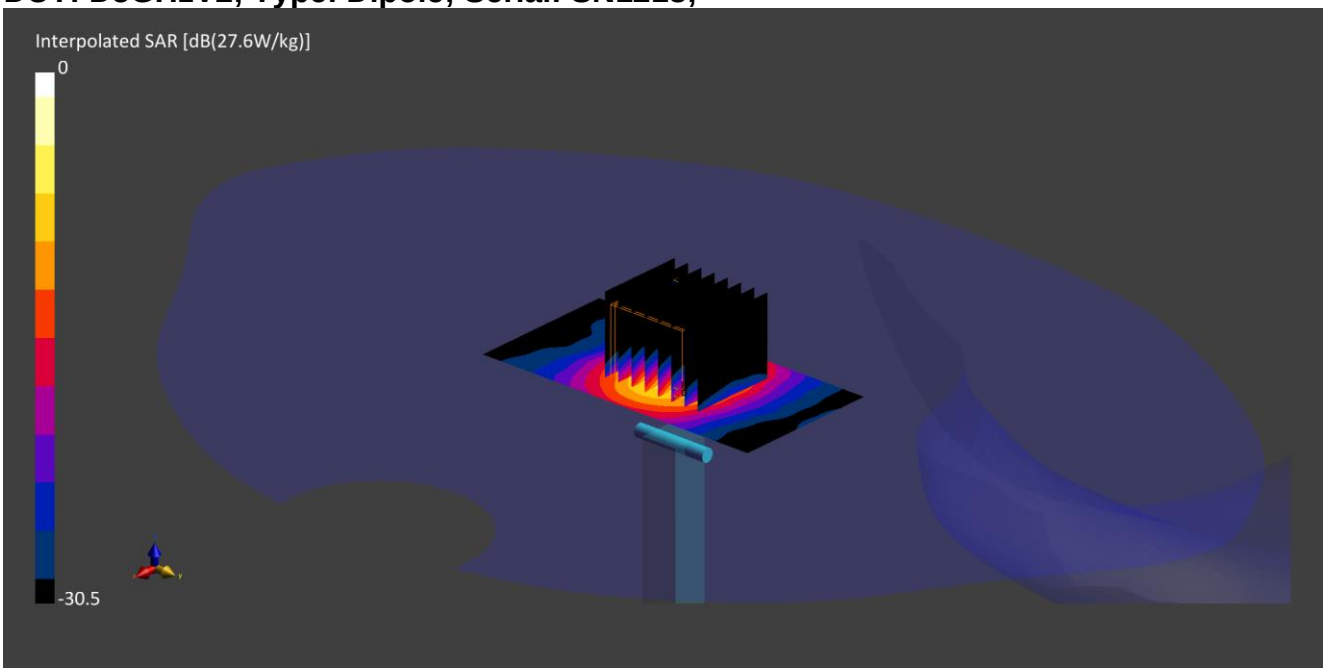


Communication System: CW UID: 0; Frequency: 5250.0 MHz; Duty Cycle: 1;
Medium: HSL; Site65_11Oct2021_131452_Head - 1800 1900 5GHz 5%; Medium parameters used: f = 5250.0 MHz; σ = 4.56 S/m; ε_r = 35.2; ρ = 1000 kg/m3; $\Delta\varepsilon_r$ = -1.97 %; $\Delta\sigma$ = -3.08 %;
No correction
Phantom section: Flat;
DASY 6 Configuration:
- Laboratory Name: Site65;
- Probe: EX3DV4 - SN7496; ConvF(5.24, 5.24, 5.24); Calibrated: 16 Mar 2021
- Sensor-Surface: 1.4 mm; VMS + 6p
- Electronics: DAE4 - SN1438; Calibrated: 12 Apr 2021
- Phantom: Twin-SAM V8.0 (30deg probe tilt); Serial: 1945
- Measurement SW: cDASY16.0.0.116

Area Scan (40x80): Interpolated grid: dx=10 mm, dy=10 mm
Zoom Scan1(22x22x22): Measurement grid: dx=4 mm, dy=4 mm, dz=1.4 mm; Grading Ratio: 1.4; Reference Value = 10.740 V/m; Power Drift = -0.01 dB
Minimum horizontal 3dB distance: 7.2 mm;
Vertical M2/M1 Ratio: 66.7 %;
SAR(1 g) = 7.620 W/kg; SAR(10 g) = 2.230 W/kg

DASY Validation Scan for Head Stimulating Liquid (HSL)

DUT: D5GHzV2; Type: Dipole; Serial: SN1213;

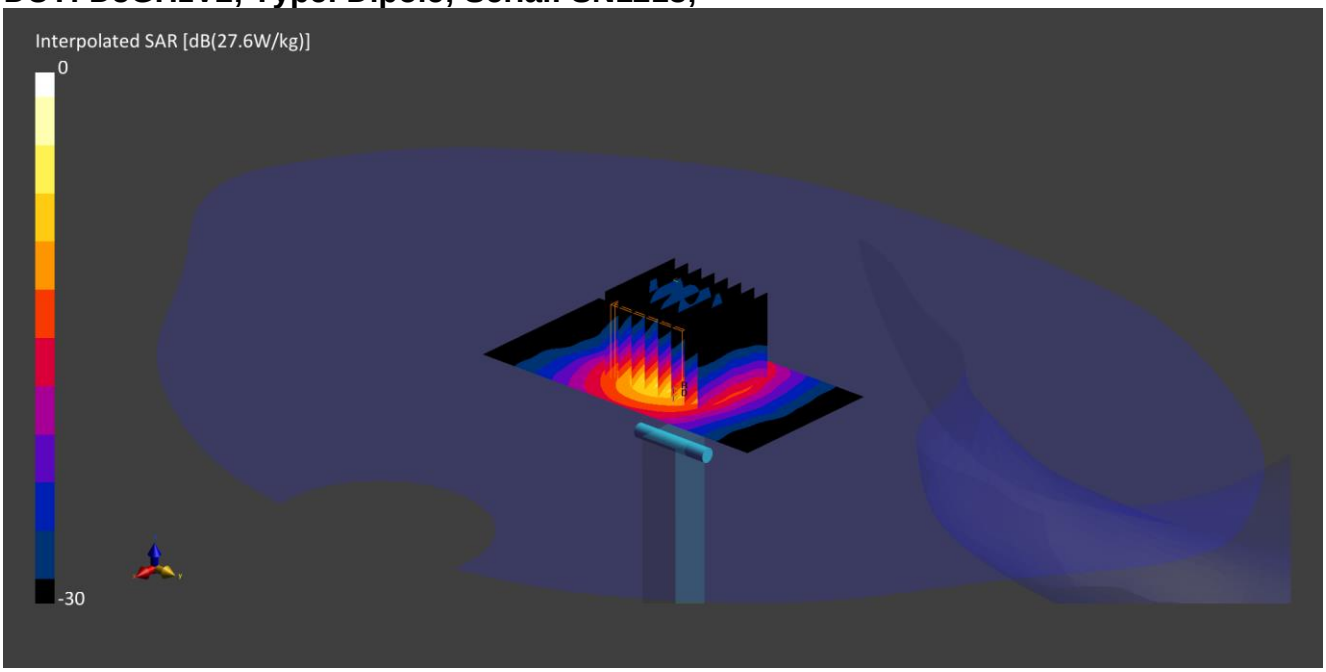


Communication System: CW UID: 0; Frequency: 5600.0 MHz; Duty Cycle: 1;
Medium: HSL; Site65_11Oct2021_131452_Head - 1800 1900 5GHz 5%; Medium parameters used: f = 5600.0 MHz; σ = 4.96 S/m; ε_r = 34.6; ρ = 1000 kg/m3; $\Delta\varepsilon_r$ = -2.62 %; $\Delta\sigma$ = -2.17 %;
No correction
Phantom section: Flat;
DASY 6 Configuration:
- Laboratory Name: Site65;
- Probe: EX3DV4 - SN7496; ConvF(4.7, 4.7, 4.7); Calibrated: 16 Mar 2021
- Sensor-Surface: 1.4 mm; VMS + 6p
- Electronics: DAE4 - SN1438; Calibrated: 12 Apr 2021
- Phantom: Twin-SAM V8.0 (30deg probe tilt); Serial: 1945
- Measurement SW: cDASY16.0.0.116

Area Scan (40x80): Interpolated grid: dx=10 mm, dy=10 mm
Zoom Scan1(22x22x22): Measurement grid: dx=4 mm, dy=4 mm, dz=1.4 mm; Grading Ratio: 1.4; Reference Value = 11.280 V/m; Power Drift = 0.03 dB
Minimum horizontal 3dB distance: 7.2 mm;
Vertical M2/M1 Ratio: 64.1 %;
SAR(1 g) = 8.180 W/kg; SAR(10 g) = 2.360 W/kg

DASY Validation Scan for Head Stimulating Liquid (HSL)

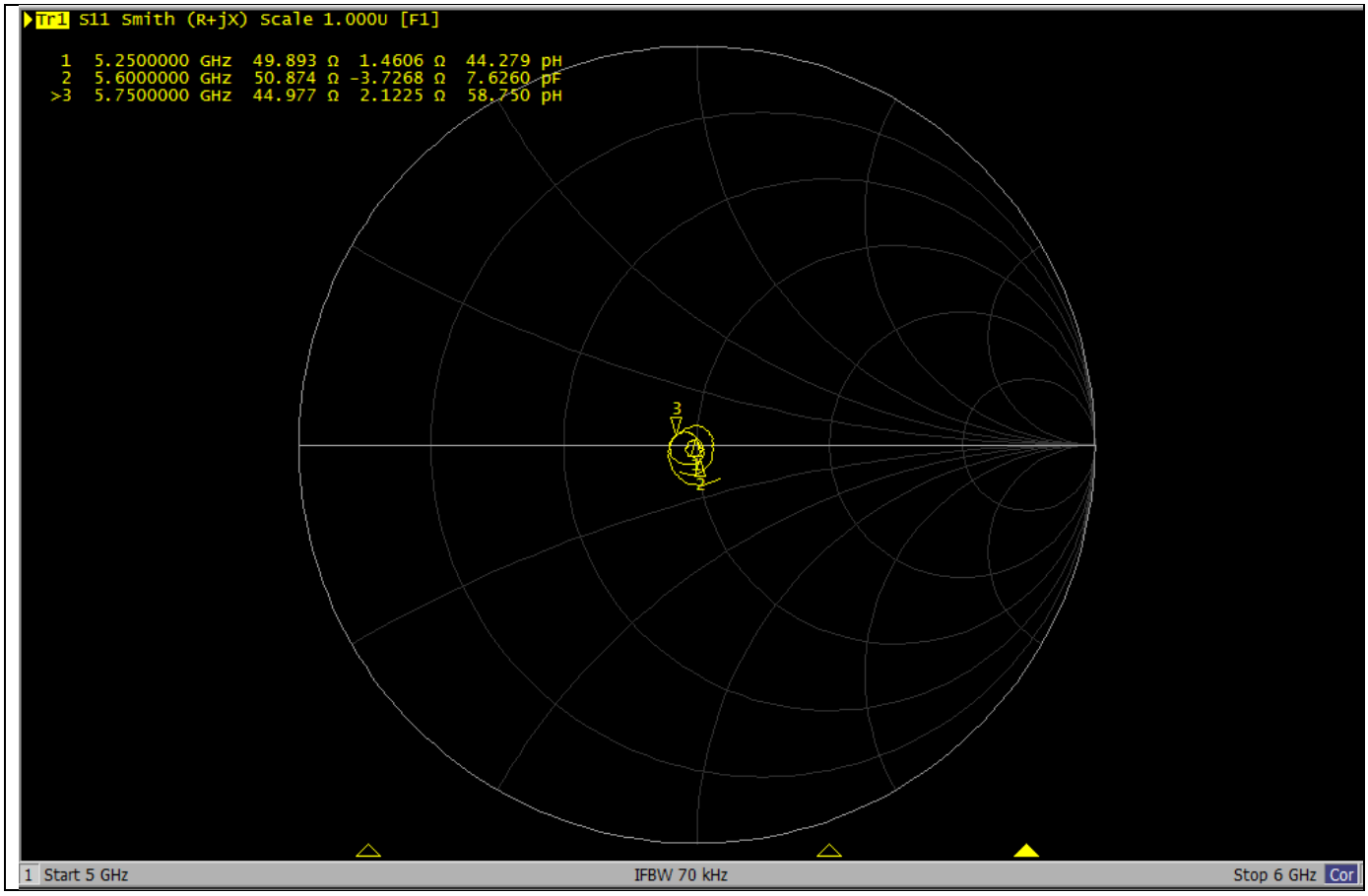
DUT: D5GHzV2; Type: Dipole; Serial: SN1213;



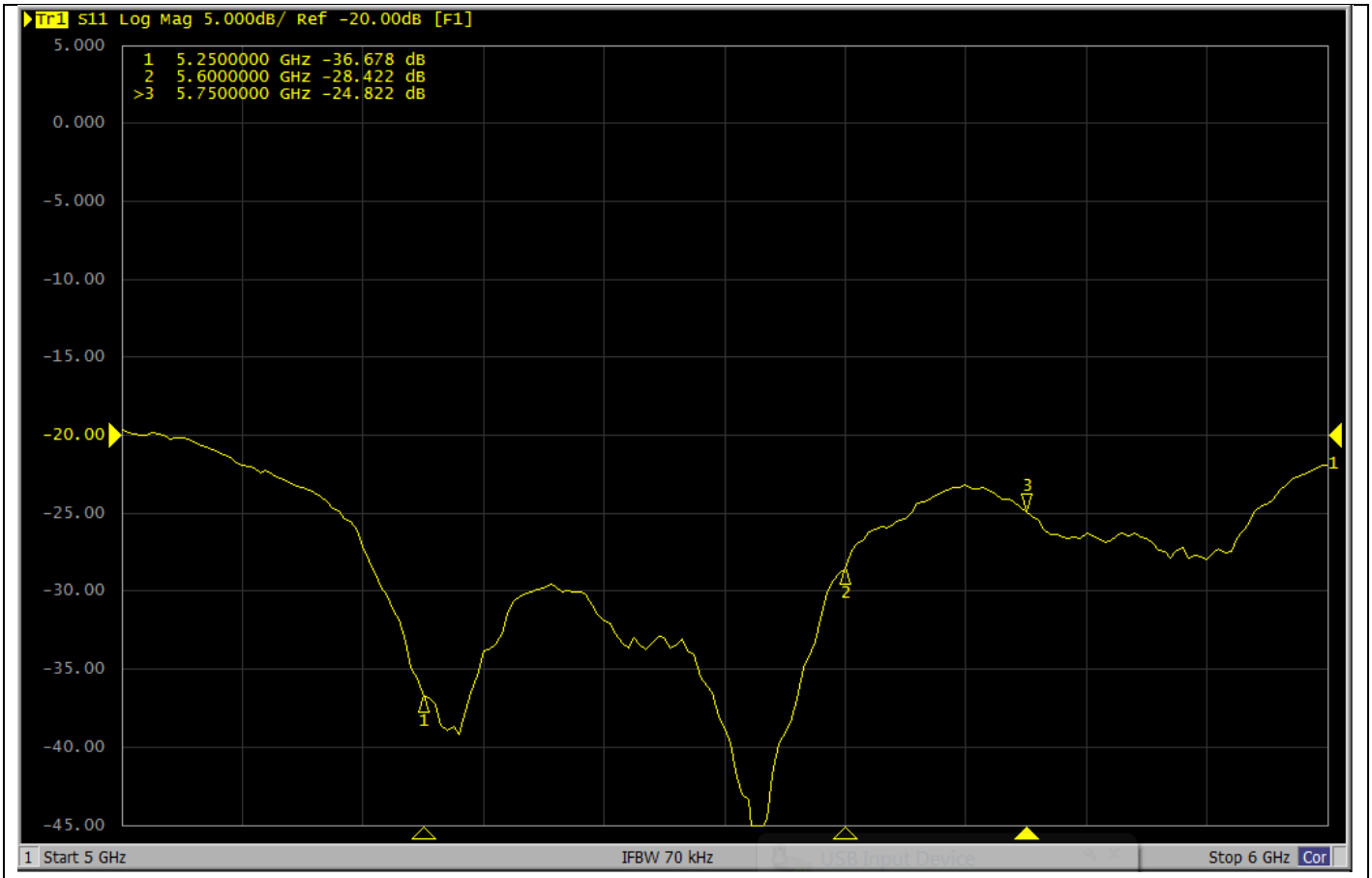
Communication System: CW UID: 0; Frequency: 5750.0 MHz; Duty Cycle: 1;
Medium: HSL; Site65_11Oct2021_131452_Head - 1800 1900 5GHz 5%; Medium parameters used: f = 5750.0 MHz; σ = 5.13 S/m; ε_r = 34.3; ρ = 1000 kg/m3; $\Delta\varepsilon_r$ = -2.89 %; $\Delta\sigma$ = -1.64 %;
No correction
Phantom section: Flat;
DASY 6 Configuration:
- Laboratory Name: Site65;
- Probe: EX3DV4 - SN7496; ConvF(4.79, 4.79, 4.79); Calibrated: 16 Mar 2021
- Sensor-Surface: 1.4 mm; VMS + 6p
- Electronics: DAE4 - SN1438; Calibrated: 12 Apr 2021
- Phantom: Twin-SAM V8.0 (30deg probe tilt); Serial: 1945
- Measurement SW: cDASY16.0.0.116

Area Scan (40x80): Interpolated grid: dx=10 mm, dy=10 mm
Zoom Scan1(22x22x22): Measurement grid: dx=4 mm, dy=4 mm, dz=1.4 mm; Grading Ratio: 1.4; Reference Value = 11.060 V/m; Power Drift = 0.03 dB
Minimum horizontal 3dB distance: 7.2 mm;
Vertical M2/M1 Ratio: 62.5 %;
SAR(1 g) = 7.550 W/kg; SAR(10 g) = 2.200 W/kg

Impedance Measurement Plot for Head Stimulating Liquid (HSL)



Return Loss Measurement Plot for Head Stimulating Liquid (HSL)



Calibration Certificate Label:

UKAS TESTING 5772	**UL INTERNATIONAL (UK) LTD** **Tel: +44 (0) 1256312100** Certificate Number: 14030223JD01G Instrument ID: 1213 Calibration Date: 12/Oct/2021 Calibration Due Date:

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

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

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client UL USA

Certificate No: D6.5GHzV2-1068_Mar22

CALIBRATION CERTIFICATE

Object	D6.5GHzV2 - SN:1068
Calibration procedure(s)	QA CAL-22.v6 Calibration Procedure for SAR Validation Sources between 3-10 GHz
Calibration date:	March 11, 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	09-Apr-21 (No. 217-03291/03292)	Apr-22
Power sensor NRP-Z91	SN: 103244	09-Apr-21 (No. 217-03291)	Apr-22
Power sensor NRP-Z91	SN: 103245	09-Apr-21 (No. 217-03292)	Apr-22
Power sensor R&S NRP33T	SN: 100967	08-Apr-21 (No. 217-03293)	Apr-22
Reference 20 dB Attenuator	SN: BH9394 (20k)	09-Apr-21 (No. 217-03343)	Apr-22
Type-N mismatch combination	SN: 310982 / 06327	09-Apr-21 (No. 217-03344)	Apr-22
Reference Probe EX3DV4	SN: 7405	31-Dec-21 (No. EX3-7405_Dec21)	Dec-22
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	SN: 827	18-Dec-18 (in house check Dec-21)	In house check: Dec-23
Network Analyzer Keysight E5063A	SN:MY54504221	31-Oct-19 (in house check Oct-19)	In house check: Oct-22

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	
Approved by:	Sven Kühn	Deputy Manager	

Issued: March 14, 2022

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 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%.

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	33.8 ± 6 %	6.10 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	27.9 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**278 W/kg ± 24.7 % (k=2)**

SAR averaged over 8 cm³ (8 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.26 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**62.3 W/kg ± 24.4 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	5.13 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**51.0 W/kg ± 24.4 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.1 Ω + 1.3 jΩ
Return Loss	- 32.3 dB

APD (Absorbed Power Density)

APD averaged over 1 cm²	Condition	
APD measured	100 mW input power	277 W/m²
APD measured	normalized to 1W	**2770 W/m² ± 29.2 % (k=2)**

APD averaged over 4 cm²	condition	
APD measured	100 mW input power	125 W/m²
APD measured	normalized to 1W	**1250 W/m² ± 28.9 % (k=2)**

*The reported APD values have been derived using 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

DASY6 Validation Report for Head TSL

Measurement Report for D6.5GHz-1068, UID 0 -, Channel 6500 (6500.0MHz)

Device under Test Properties

Name, Manufacturer	Dimensions [mm]	IMEI	DUT Type
D6.5GHz	16.0 x 6.0 x 300.0	SN: 1068	-

Exposure Conditions

Phantom Section, TSL	Position, Test Distance [mm]	Band	Group, UID	Frequency [MHz]	Conversion Factor	TSL Cond. [S/m]	TSL Permittivity
Flat, HSL	5.00	Band	CW,	6500	5.75	6.10	33.8

Hardware Setup

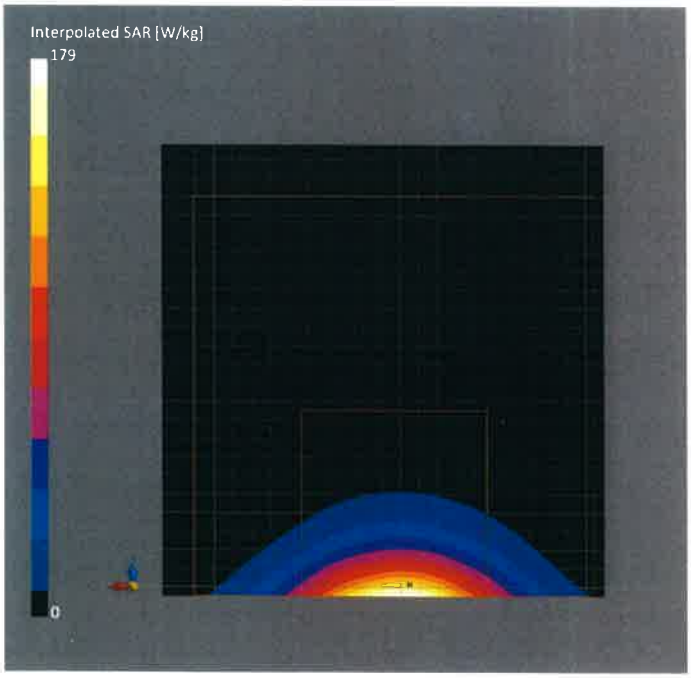
Phantom	TSL	Probe, Calibration Date	DAE, Calibration Date
MFP V8.0 Center - 1182	HBBL600-10000V6	EX3DV4 - SN7405, 2021-12-31	DAE4 Sn908, 2021-06-24

Scan Setup

	Zoom Scan
Grid Extents [mm]	22.0 x 22.0 x 22.0
Grid Steps [mm]	3.4 x 3.4 x 1.4
Sensor Surface [mm]	1.4
Graded Grid	Yes
Grading Ratio	1.4
MAIA	N/A
Surface Detection	VMS + 6p
Scan Method	Measured

Measurement Results

	Zoom Scan
Date	2022-03-11, 12:26
psSAR1g [W/Kg]	27.9
psSAR8g [W/Kg]	6.26
psSAR10g [W/Kg]	5.13
Power Drift [dB]	0.00
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	No correction
M2/M1 [%]	50.2
Dist 3dB Peak [mm]	4.8



Impedance Measurement Plot for Head TSL