

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



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client: **HCT**
Gyeonggi-do, Republic of Korea

Certificate No. **D3700V2-1066_Sep25**

CALIBRATION CERTIFICATE

Object: **D3700V2 - SN: 1066**

Calibration procedure(s): **QA CAL-22.v7**
Calibration Procedure for SAR Validation Sources between 3 - 10 GHz

Calibration date: **September 15, 2025**

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&E critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Cal
Power Sensor R&S NRP-33T	SN: 100967	30-Apr-25 (No. 1620-300791798)	Apr-26
Power Sensor R&S NRP16A	SN: 101959	06-Feb-25 (No. 4030A315009541)	Feb-26
Spectrum Analyzer R&S FS40	SN: 101832	29-Jan-25 (No. 4030A315009568)	Jan-26
3.5mm mismatch combination	SN: 1152	24-Mar-25 (No. 217-04293)	Mar-26
DCP DAK-12	SN: 1016	24-Sep-24 (No. OCP-DAK12-1016_Sep24)	Sep-25
DCP DAK-3.5	SN: 1249	23-Sep-24 (No. OCP-DAK3.5-1249_Sep24)	Sep-25
Tolerance Probe EX31V4	SN: 7349	10-Jan-25 (No. EX3-7349_Jan25)	Jan-26
DAE4ip	SN: 1636	04-Sep-25 (No. DAE4ip-1636_Sep25)	Sep-26

Secondary Standards	ID	Check Date (in House)	Scheduled Check
ACAD Setup 1	SN: 1000	27-May-25 (No. 875-ACAD_Source_Box-250527)	May-26
Signal Generator R&S SMB100A	SN: 182081	27-May-25 (No. 875-CAL16-S4588-250527)	May-26
Mismatch: SMA	SN: 1102	24-Apr-25 (No. 875-Mismatch_SMA-250424)	Apr-26
DCP DAK-12	SN: 1029	27-Feb-25 (No. OCP-DAK12-1029_Feb25)	Feb-26
DCP DAK-3.5	SN: 1336	09-Dec-24 (No. OCP-DAK3.5-1336_Dec24)	Dec-25

	Name	Function	Signature
Calibrated by	Paula Pina	Laboratory Technician	
Approved by	Sven Köhn	Technical Manager	
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			
Issued: September 17, 2025			

Certificate No.: **D3700V2-1066_Sep25**

Page 1 of 8

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10/25	7/2/25				
11/3	7/25/25				

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Accreditation No.: **SCS 0108**

Glossary

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

Calibration is Performed According to the Following Standards

- IEC/IEEE 82209-1529, "Measurement Procedures For The Assessment Of Specific Absorption Rate Of Human Exposure To Radio Frequency Fields From Hand-Held And Body Worn Wireless Communication Devices - Part 1529: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", (October 2020)
- KDB 865654, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation

- 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.
- **Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- **SAR measured:** SAR measured at the stated antenna input power.
- **SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- **SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

D3700V2 - SN: 1066

September 15, 2025

Measurement Conditions

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

DASY Version	DASY8 Module SAR	17.0.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with spacer
Zoom Scan Resolution	$\Delta x, \Delta y = 5\text{ mm}, \Delta z = 1.4\text{ mm}$	Graded Ratio = 1.5 mm (Z direction)
Frequency	3700MHz $\pm 1\text{ MHz}$	

HSL parameters at 3700 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal HSL parameters	22.0 °C	37.7	3.12 mho/m
Measured HSL parameters	(22.0 $\pm$ 0.2) °C	39.4 $\pm$ 6%	3.10 mho/m $\pm$ 6%
HSL temperature change during test	< 0.5 °C		

SAR result with HSL at 3700 MHz

SAR averaged over 1 cm ³ (1 g) of HSL	Condition	
SAR for nominal HSL parameters	20 dBm input power	6.77 W/kg
SAR for nominal HSL parameters	normalized to 1W	67.7 W/kg $\pm$ 19.9% (k=2)

SAR averaged over 10 cm ³ (10 g) of HSL	Condition	
SAR for nominal HSL parameters	20 dBm input power	2.50 W/kg
SAR for nominal HSL parameters	normalized to 1W	25.0 W/kg $\pm$ 19.5% (k=2)

03700V2 - SN/ 1068

September 15, 2025

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with HSL at 3700 MHz

Impedance:	48.1 Ω $\pm$ 2.1 j Ω
Return Loss:	-30.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.13 ns
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After long term use with 100W realized 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

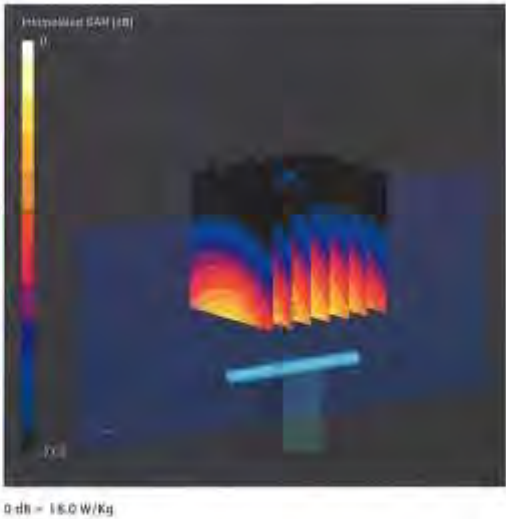
Manufactured by:	SPEAG
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D3700V2 - SN: 1066

September 15, 2025

System Performance Check Report

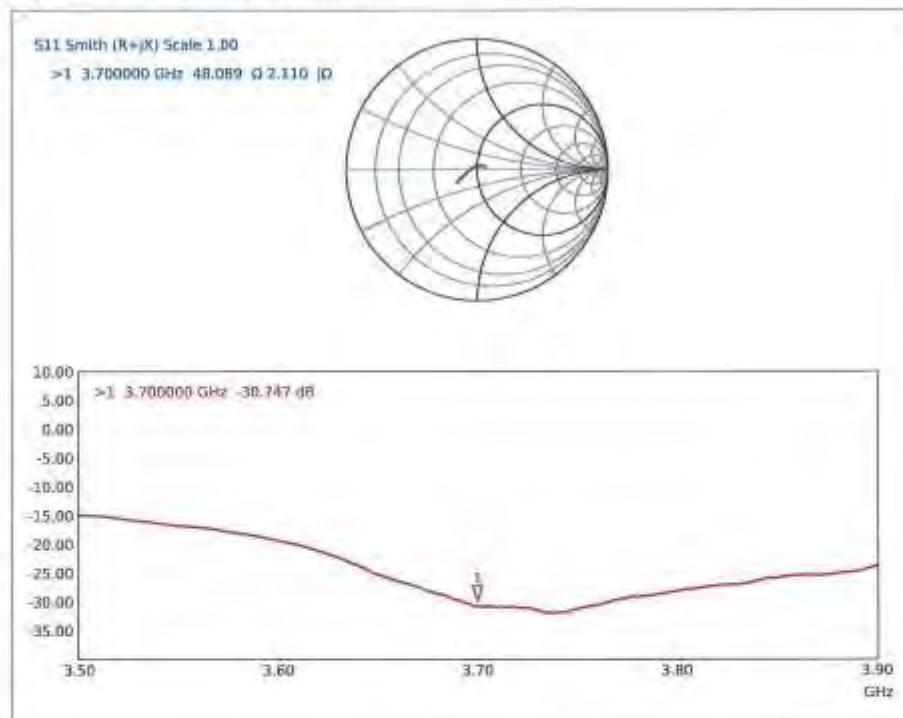
Summary							
Device	Frequency (MHz)			TSL	Power (dBm)		
D3700V2 - SN1066	3700			REL	30		
Exposure Conditions							
Phantom Section, TSL	Test Distance (mm)	Lead	Group, IED	Frequency (MHz), Channel Number	Conductive Factor	TSL Conductivity (S/m)	TSL Permittivity
Flat	10		CW, D---	3700, 0	0.43	0.10	JS4
Hardware Setup							
Platform	TSL, Measured Date		Probe, Calibration Date		DAC, Calibration Date		
MIP V8.0 Canon	HCL, 2025-09-15		EX30V4 - SN7346, 2025-01-10		DAC4p Sn1836, 2025-09-04		
Scans Setup				Measurement Results			
				Zoom Scan			
Grid Extents (mm)				Date			
28 x 28 x 28				2025-09-15			
Grid Steps (mm)				pSAR1g (W/Kg)			
1.0 x 1.0 x 1.4				0.77			
Sensor Surface (mm)				pSAR10g (W/Kg)			
1.4				2.30			
Grating Grid				Power (dB (dB))			
Yes				-0.02			
Grating Ratio				Power Scaling			
1.5				Disabled			
MNA				Scaling Factor (dB)			
H1A							
Surface Orientation				TSL Coefficient			
VMS = 60				Positive / Negative			
Scan Method				Measured			



D3700V2 - SN: 1066

September 15, 2025

Impedance Measurement Plot for HSL



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Accreditation No.: **SCS 0108**

Client: **HCT**
 Gyeonggi-do, Republic of Korea

Certificate No.: **D3900V2-1019_May25**

CALIBRATION CERTIFICATE

Object: **D3900V2 - SN: 1019**

Calibration procedure(s): **QA CAL-22.v7**
Calibration Procedure for SAR Validation Sources between 3 - 10 GHz

Calibration date: **May 21, 2025**

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&E critical for calibration):

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Cal
Power Sensor R&S NRP-33T	SN: 100987	26-Mar-25 (No. 217-04290)	Mar-26
Power Sensor R&S NRP13A	SN: 101858	06-Feb-25 (No. 4030A315009541)	Feb-26
Spectrum Analyzer R&S FSV40	SN: 101832	29-Jan-25 (No. 4020A315009658)	Jan-28
3.5mm mismatch combination	SN: 1152	24-Mar-25 (No. 217-04293)	Mar-26
OCP DAK-12	SN: 1016	24-Sept-24 (No. OCP-DAK12-1016_Sep24)	Sep-25
OCP DAK-3.5	SN: 1249	23-Sept-24 (No. OCP-DAK3.5-1249_Sep24)	Sep-25
Reference Probe EX3DV4	SN: 7349	10-Jan-25 (No. EX3-7349_Jan25)	Jan-26
DAE4ip	SN: 1836	17-Apr-25 (No. DAE4ip-1836_Apr25)	Apr-26

Secondary Standards	ID	Check Date (in house)	Scheduled Check
ACAD Setup 1	SN: 1000	28-May-24 (No. 675-ACAD_Source_Box-240528)	May-25
Signal Generator R&S SMET00A	SN: 182061	28-May-24 (No. 675-CAL16-S4888-240528)	May-25
Mismatch: SMA	SN: 1102	22-May-24 (No. 675-Mismatch_SMA-240522)	May-25

Name	Function	Signature
Calibrated by: Paulo Pino	Laboratory Technician	
Approved by: Sven Kline	Technical Manager	
		Issued: May 21, 2025
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.		

절	담당자	확인자
제		
일	93 10538	85 10132
일	2025 10529	2025 10529

Certificate No: **D3900V2-1019_May25**

Page 1 of 6

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Accreditation No.: **SCS 0108**

Glossary

TSL: tissue simulating liquid
ConvF: sensitivity in TSL / NORM $\times, \mu\text{r}$
N/A: not applicable or not measured

Calibration Is Performed According to the Following Standards

- IEC/IEEE 62209-152B "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 152B: Human Models, Instrumentation And Procedures (Frequency Range of 4 MHz to 10 GHz)", October 2020.
- KDB 065664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation

- 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.
- **Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- **SAR measured:** SAR measured at the stated antenna input power.
- **SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- **SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Certificate No: D3900V2-1018_May25

Page 2 of 6

D3900V2 - SN: 1019

May 21, 2025

Measurement Conditions

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

DASY Version	DASY8 Module SAR	16.4.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with spacer
Zoom Scan Resolution	dx, dy = 5mm, dz = 1.4mm	Graded Ratio = 1.5 mm (Z direction)
Frequency	3900MHz $\pm$ 1MHz	

HSL parameters at 3900 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal HSL parameters	22.0 °C	37.5	3.32 mho/m
Measured HSL parameters	(22.0 $\pm$ 0.2)°C	38.6 $\pm$ 6%	3.32 mho/m $\pm$ 6%
HSL temperature change during test	< 0.5 °C		

SAR result with HSL at 3900 MHz

SAR averaged over 1 cm ³ (1 g) of HSL	Condition	
SAR for nominal HSL parameters	20 dBm input power	7.03 W/kg
SAR for nominal HSL parameters	normalized to 1W	70.3 W/kg $\pm$ 19.9% (k = 2)

SAR averaged over 10 cm ³ (10 g) of HSL	Condition	
SAR for nominal HSL parameters	20 dBm input power	2.47 W/kg
SAR for nominal HSL parameters	normalized to 1W	24.7 W/kg $\pm$ 19.5% (k = 2)

D3900V2 - SN: 1019

May 21, 2025

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with HSL at 3900 MHz

Impedance	47.5 Ω - 6.3 j Ω
Return Loss	-23.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.103 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured. The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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D3900V2 - SN: 1019

May 21, 2025

System Performance Check Report

Summary

Sample	Frequency (MHz)	TSL	Power (dBm)
D3900V2 - SN1019	3000	MSL	20

Exposure Conditions

Phantom Device, TSL	Test Distance (mm)	Surf	Expos. Vol	Frequency (MHz)	Channel Number	Conversion Factor	TSL Conductivity (S/cm)	TSL Permittivity
Test	10	CRC, D	3000, D			6.37	1.32	34.6

Hardware Setup

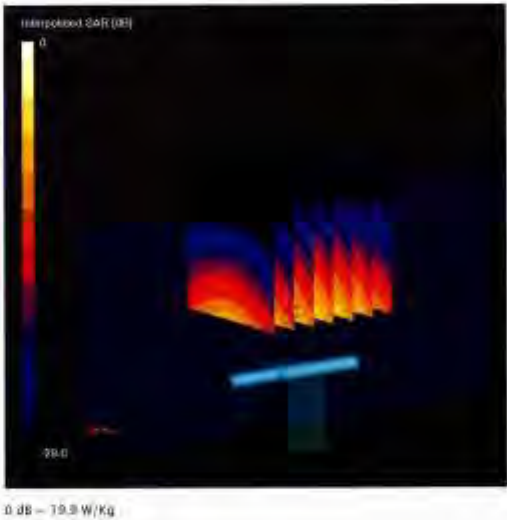
Phantom	TSL Measurement Date	Probe Calibration Date	DWG Calibration Date
MFP V8.0 Center	MSL, 2025-05-21	D3900V4 - SMFS-09, 2025-03-19	DW/eq Set 0.00, 2025-04-11

Scans Setup

	Zoom Scan
Grid Lines (mm)	30 x 20 x 20
Grid Steps (mm)	5.0 x 5.0 x 1.4
Sensor Surface (mm)	1.4
Grided Grid	Yes
Griding Ratio	1.5
SAAS	N/A
Surface Definition	VMS + Ep
Scan Method	Measured

Measurement Results

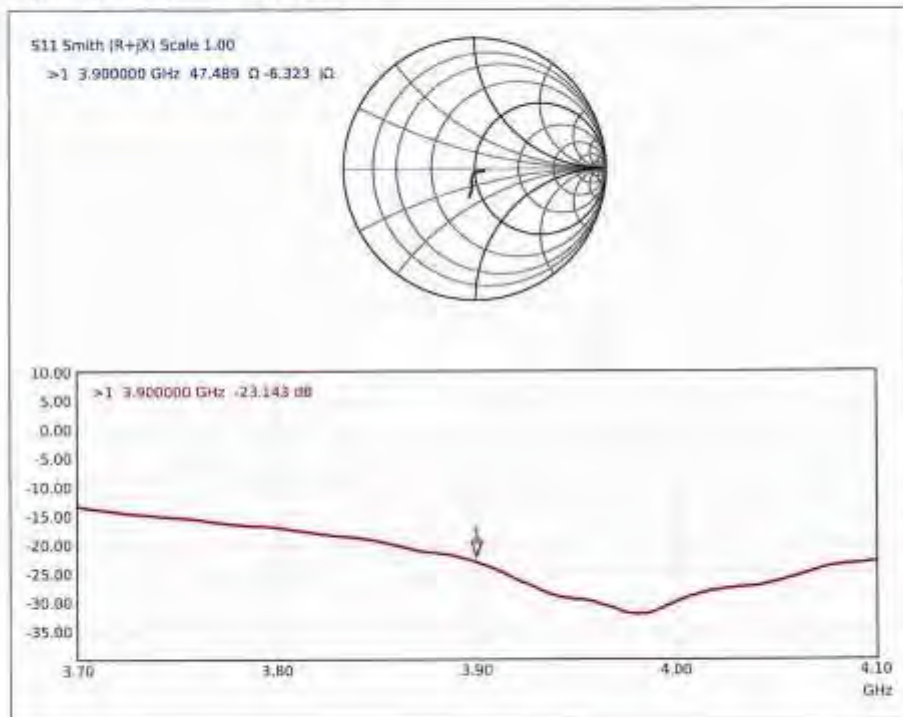
	Zoom Scan
Date	2025-05-21
psdA1 (W/Kg)	7.03
psdA1 (W/Kg)	2.47
Power D/Ft (dB)	6.00
Power Scaling	Disabled
Scaling Factor (dB)	
TSL Correction	Positive / Negative



D3900V2 - SN: 1019

May 21, 2025

Impedance Measurement Plot for HSL



Certificate No: D3900V2-1019_May25

Page 6 of 6