

## Appendix D - Calibration Certificate for Dipole



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 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 **Eurofins E&E Wireless**  
 New Taipei City

Certificate No.

**D1900V2-5d111\_Jun25**

## CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d111**

Calibration procedure(s) **QA CAL-05.v12**  
 Calibration Procedure for SAR Validation Sources between 0.7 - 3 GHz

Calibration date **June 3, 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  $(22 \pm 3)^\circ\text{C}$  and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Cal
Power Sensor R&S NRP-33T	SN: 100967	26-Mar-25 (No. 217-04290)	Mar-26
Power Sensor R&S NRP18A	SN: 101859	06-Feb-25 (No. 4030A315009541)	Feb-26
Spectrum Analyzer R&S FSV40	SN: 101832	29-Jan-25 (No. 4030A315009658)	Jan-26
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	27-May-25 (No. 675-ACAD_Source_Box-250527)	May-26
Signal Generator R&S SMB100A	SN: 182081	27-May-25 (No. 675-CAL16-S4588-250527)	May-26
Mismatch; SMA	SN: 1102	24-Apr-25 (No. 675-Mismatch_SMA-250424)	Apr-26

Calibrated by	Name	Function	Signature
Calibrated by	Claudio Leubler	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	

Issued: June 3, 2025

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



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Accreditation No.: **SCS 0108**

## Glossary

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

## Calibration is Performed According to the Following Standards

- 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.
- KDB 865664, "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%.

## Measurement Conditions

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

<b>DASY Version</b>	DASY8 Module SAR		16.4.0
<b>Extrapolation</b>	Advanced Extrapolation		
<b>Phantom</b>	Modular Flat Phantom		
<b>Distance Dipole Center - TSL</b>	10 mm		with spacer
<b>Zoom Scan Resolution</b>	dx, dy = 6mm, dz = 1.5mm		Graded Ratio = 1.5 mm (Z direction)
<b>Frequency</b>	1900MHz $\pm$ 1MHz		

## HSL parameters at 1900 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal HSL parameters</b>	22.0 °C	40.0	1.40 mho/m
<b>Measured HSL parameters</b>	(22.0 $\pm$ 0.2)°C	40.4 $\pm$ 6%	1.40 mho/m $\pm$ 6%
<b>HSL temperature change during test</b>	< 0.5 °C		

## SAR result with HSL at 1900 MHz

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of HSL</b>	Condition	
SAR for nominal HSL parameters	24 dBm input power	9.95 W/kg
SAR for nominal HSL parameters	normalized to 1W	39.6 W/kg $\pm$ 17.0% (k = 2)

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of HSL</b>	Condition	
SAR for nominal HSL parameters	24 dBm input power	5.27 W/kg
SAR for nominal HSL parameters	normalized to 1W	21.0 W/kg $\pm$ 16.5% (k = 2)

**Appendix (Additional assessments outside the scope of SCS 0108)****Antenna Parameters with HSL at 1900 MHz**

Impedance	50.0 $\Omega$ + 5.8 $j\Omega$
Return Loss	-24.8 dB

**General Antenna Parameters and Design**

Electrical Delay (one direction)	1.201 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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## System Performance Check Report

## Summary

Dipole	Frequency [MHz]	TSL	Power [dBm]
D1900V2 - SN5d111	1900	HSL	24

## Exposure Conditions

Phantom Section, TSL	Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat	10	CW, 0--		1900, 0	7.68	1.40	40.4

## Hardware Setup

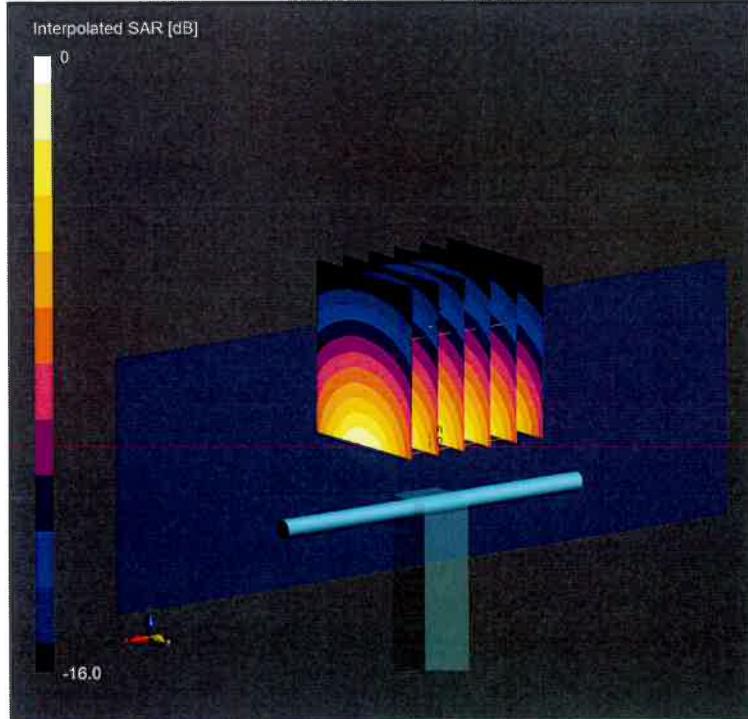
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
MFP V8.0 Center	HSL, 2025-06-03	EX3DV4 - SN7349, 2025-01-10	DAE4ip Sn1836, 2025-04-17

## Scans Setup

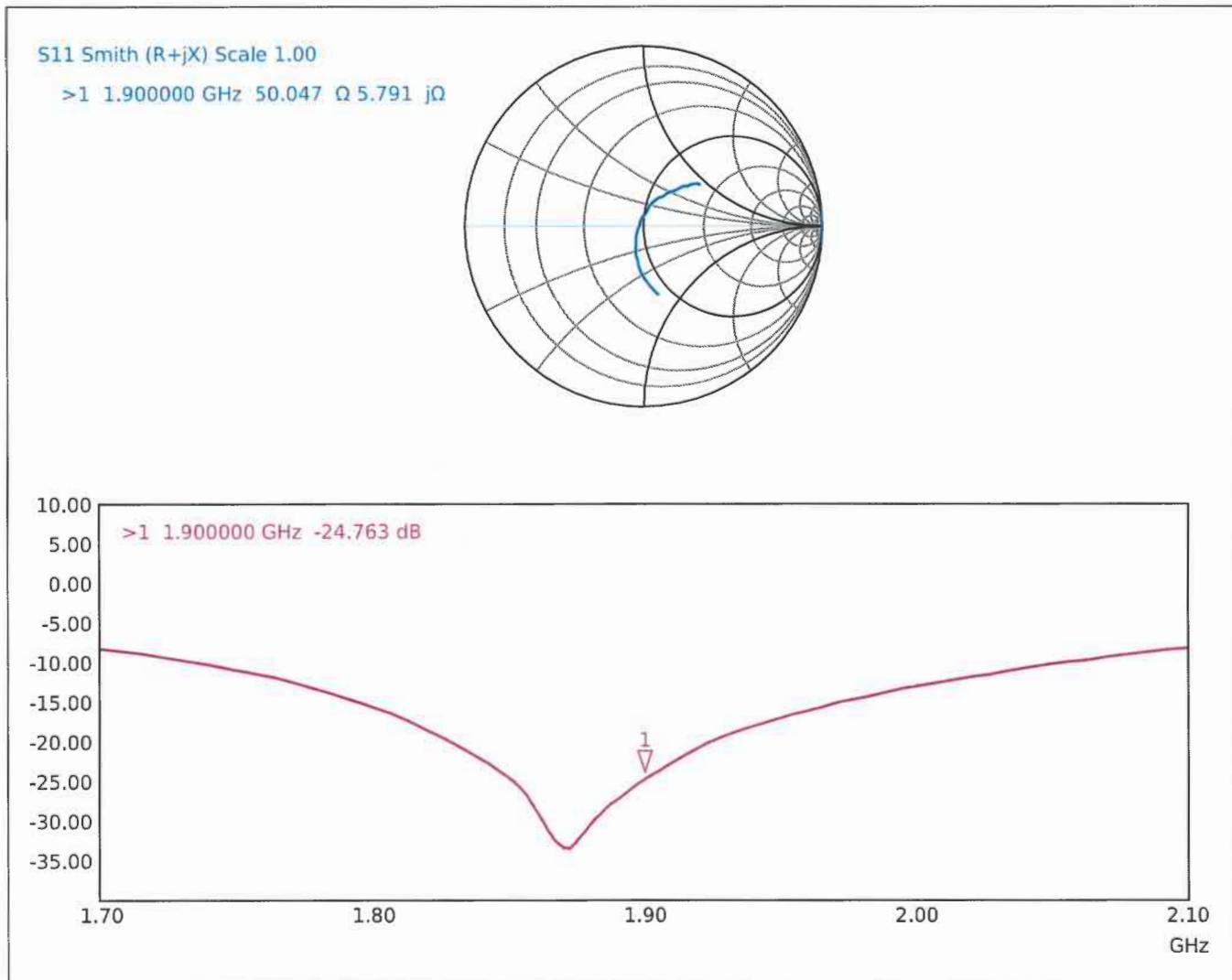
	Zoom Scan
Grid Extents [mm]	30 x 30 x 30
Grid Steps [mm]	6.0 x 6.0 x 1.5
Sensor Surface [mm]	1.4
Graded Grid	Yes
Grading Ratio	1.5
MAIA	N/A
Surface Detection	VMS + 6p
Scan Method	Measured

## Measurement Results

	Zoom Scan
Date	2025-06-03
psSAR1g [W/Kg]	9.95
psSAR10g [W/Kg]	5.27
Power Drift [dB]	0.01
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



0 dB = 17.6 W/Kg

**Impedance Measurement Plot for HSL**

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



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

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Accreditation No.: SCS 0108

Client **Eurofins E&E Wireless**  
 New Taipei City

Certificate No.

**D2600V2-1197\_Jun25**

## CALIBRATION CERTIFICATE

Object **D2600V2 - SN: 1197**

Calibration procedure(s) **QA CAL-05.v12**  
 Calibration Procedure for SAR Validation Sources between 0.7 - 3 GHz

Calibration date **June 3, 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  $(22 \pm 3)^\circ\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Cal
Power Sensor R&S NRP-33T	SN: 100967	26-Mar-25 (No. 217-04290)	Mar-26
Power Sensor R&S NRP18A	SN: 101859	06-Feb-25 (No. 4030A315009541)	Feb-26
Spectrum Analyzer R&S FSV40	SN: 101832	29-Jan-25 (No. 4030A315009658)	Jan-26
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	27-May-25 (No. 675-ACAD_Source_Box-250527)	May-26
Signal Generator R&S SMB100A	SN: 182081	27-May-25 (No. 675-CAL16-S4588-250527)	May-26
Mismatch; SMA	SN: 1102	24-Apr-25 (No. 675-Mismatch_SMA-250424)	Apr-26

Calibrated by	Name	Function	Signature
Calibrated by	Claudio Leubler	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	

Issued: June 4, 2025

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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)  
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Accreditation No.: **SCS 0108**

## Glossary

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

## Calibration is Performed According to the Following Standards

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## 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.
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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.

<b>DASY Version</b>	DASY8 Module SAR	
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom	
<b>Distance Dipole Center - TSL</b>	10 mm	with spacer
<b>Zoom Scan Resolution</b>	dx, dy = 5mm, dz = 1.5mm	Graded Ratio = 1.5 mm (Z direction)
<b>Frequency</b>	2600MHz $\pm$ 1MHz	

## HSL parameters at 2600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal HSL parameters</b>	22.0 °C	39.0	1.96 mho/m
<b>Measured HSL parameters</b>	(22.0 $\pm$ 0.2)°C	37.3 $\pm$ 6%	2.01 mho/m $\pm$ 6%
<b>HSL temperature change during test</b>	< 0.5 °C		

## SAR result with HSL at 2600 MHz

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of HSL</b>	Condition	
SAR for nominal HSL parameters	24 dBm input power	14.2 W/kg
SAR for nominal HSL parameters	normalized to 1W	56.5 W/kg $\pm$ 17.0% (k=2)

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of HSL</b>	Condition	
SAR for nominal HSL parameters	24 dBm input power	6.38 W/kg
SAR for nominal HSL parameters	normalized to 1W	25.4 W/kg $\pm$ 16.5% (k=2)

**Appendix (Additional assessments outside the scope of SCS 0108)****Antenna Parameters with HSL at 2600 MHz**

Impedance	47.7 $\Omega$ – 2.0 $j\Omega$
Return Loss	-30.2 dB

**General Antenna Parameters and Design**

Electrical Delay (one direction)	1.147 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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## System Performance Check Report

## Summary

Dipole	Frequency [MHz]	TSL	Power [dBm]
D2600V2 - SN1197	2600	HSL	24

## Exposure Conditions

Phantom Section, TSL	Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat	10	CW, 0---		2600, 0	7.26	2.01	37.3

## Hardware Setup

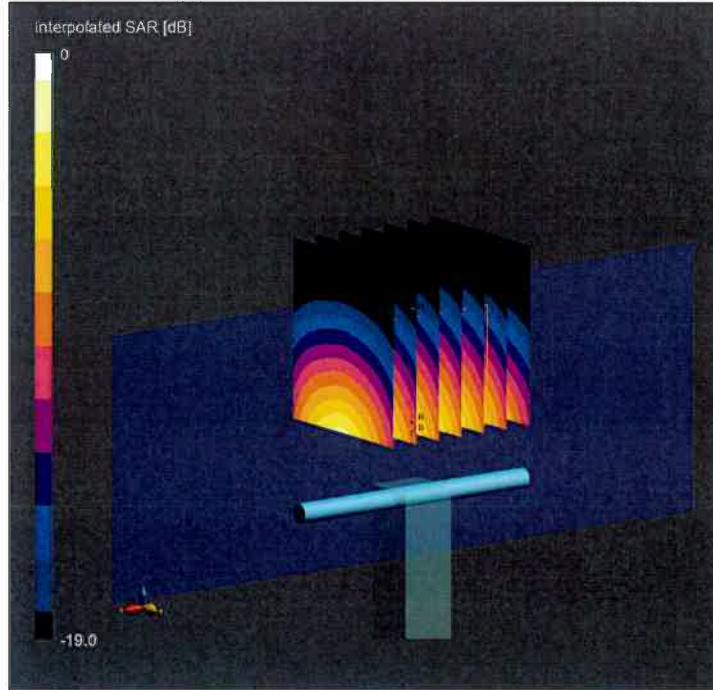
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
MFP V8.0 Center	HSL, 2025-06-03	EX3DV4 - SN7349, 2025-01-10	DAE4ip Sn1836, 2025-04-17

## Scans Setup

	Zoom Scan
Grid Extents [mm]	30 x 30 x 30
Grid Steps [mm]	5.0 x 5.0 x 1.5
Sensor Surface [mm]	1.4
Graded Grid	Yes
Grading Ratio	1.5
MAIA	N/A
Surface Detection	VMS + 6p
Scan Method	Measured

## Measurement Results

	Zoom Scan
Date	2025-06-03
psSAR1g [W/Kg]	14.2
psSAR10g [W/Kg]	6.38
Power Drift [dB]	-0.02
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



**Impedance Measurement Plot for HSL**