

C.2. System Validation Dipole D2450V2 (Serial No. 936 / Control No. WA0026)

Please see the following pages.

**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

SONY Global M&O
Chiba, Japan

Certificate No.

D2450V2-936_Jun25**CALIBRATION CERTIFICATE**

Object

D2450V2 - SN: 936

Calibration procedure(s)

QA CAL-05.v12

Calibration Procedure for SAR Validation Sources between 0.7 - 3 GHz

Calibration date

June 18, 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&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
OCP DAK-12	SN: 1029	27-Feb-25 (No. OCP-DAK12-1029_Feb25)	Feb-26
OCP DAK-3.5	SN: 1336	09-Dec-24 (No. OCP-DAK3.5-1336_Dec24)	Dec-25

	Name	Function	Signature
Calibrated by	Leif Klysner	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			
Issued: June 18, 2025			

Certificate No: D2450V2-936_Jun25

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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%.

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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 = 1.5mm	Graded Ratio = 1.5 mm (Z direction)
Frequency	2450MHz $\pm$ 1MHz	

HSL parameters at 2450 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal HSL parameters	22.0 °C	39.2	1.80 mho/m
Measured HSL parameters	(22.0 $\pm$ 0.2)°C	37.8 $\pm$ 6%	1.84 mho/m $\pm$ 6%
HSL temperature change during test	< 0.5 °C		

SAR result with HSL at 2450 MHz

SAR averaged over 1 cm³ (1 g) of HSL	Condition	
SAR for nominal HSL parameters	24 dBm input power	13.1 W/kg
SAR for nominal HSL parameters	normalized to 1W	52.2 W/kg $\pm$ 17.0% (k = 2)

SAR averaged over 10 cm³ (10 g) of HSL	Condition	
SAR for nominal HSL parameters	24 dBm input power	6.18 W/kg
SAR for nominal HSL parameters	normalized to 1W	24.6 W/kg $\pm$ 16.5% (k = 2)

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MSL parameters at 2450 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal MSL parameters	22.0 °C	52.7	1.95 mho/m
Measured MSL parameters	(22.0 ±0.2)°C	52.3 ±6%	2.03 mho/m ±6%
MSL temperature change during test	< 0.5 °C		

SAR result with MSL at 2450 MHz

SAR averaged over 1 cm ³ (1 g) of MSL	Condition	
SAR for nominal MSL parameters	24 dBm input power	12.7 W/kg
SAR for nominal MSL parameters	normalized to 1W	50.6 W/kg ±17.0% (k = 2)

SAR averaged over 10 cm ³ (10 g) of MSL	Condition	
SAR for nominal MSL parameters	24 dBm input power	6.08 W/kg
SAR for nominal MSL parameters	normalized to 1W	24.2 W/kg ±16.5% (k = 2)

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Appendix (Additional assessments outside the scope of SCS 0108)
Antenna Parameters with HSL at 2450 MHz

Impedance	55.2 Ω + 2.6 jΩ
Return Loss	-25.2 dB

Antenna Parameters with MSL at 2450 MHz

Impedance	51.4 Ω + 4.0 jΩ
Return Loss	-27.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.153 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.

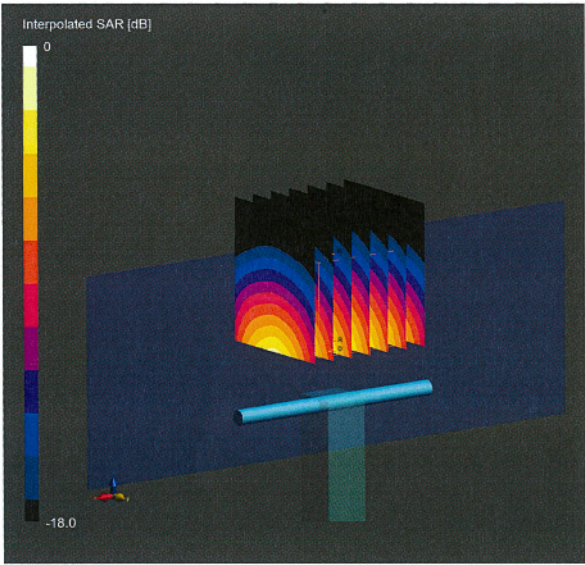
Additional EUT Data

Manufactured by	SPEAG
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System Performance Check Report

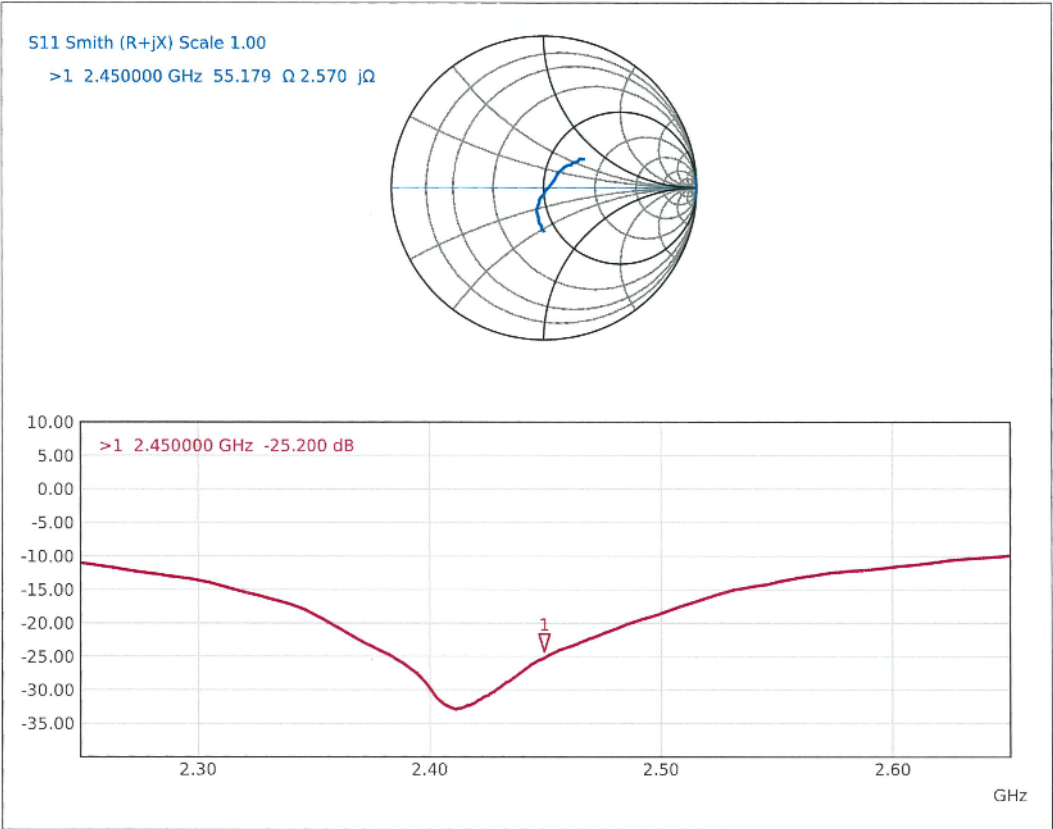
Summary								
Dipole		Frequency [MHz]			TSL	Power [dBm]		
D2450V2 – SN936		2450			HSL	24		
Exposure Conditions								
Phantom Section, TSL	Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number		Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat	10		CW, 0---	2450, 0		7.06	1.84	37.8
Hardware Setup								
Phantom	TSL Measured Date		Probe, Calibration Date			DAE, Calibration Date		
MFP V8.0 Center	HSL 2025-06-17		EX3DV4 SN7349, 2025-01-10			DAE4ip Sn1836, 2025-04-17		
Scans Setup				Measurement Results				
			Zoom Scan	Zoom Scan				
Grid Extents [mm]			30 x 30 x 30	Date2025-06-17				
Grid Steps [mm]			5.0 x 5.0 x 1.5	psSAR1g [W/Kg]13.1				
Sensor Surface [mm]			1.4	psSAR10g [W/Kg]6.18				
Graded Grid			Yes	Power Drift [dB]0.01				
Grading Ratio			1.5	Power ScalingDisabled				
MAIA			N/A	Scaling Factor [dB]				
Surface Detection			VMS 1 6p	TSL CorrectionPositive / Negative				
Scan Method			Measured					



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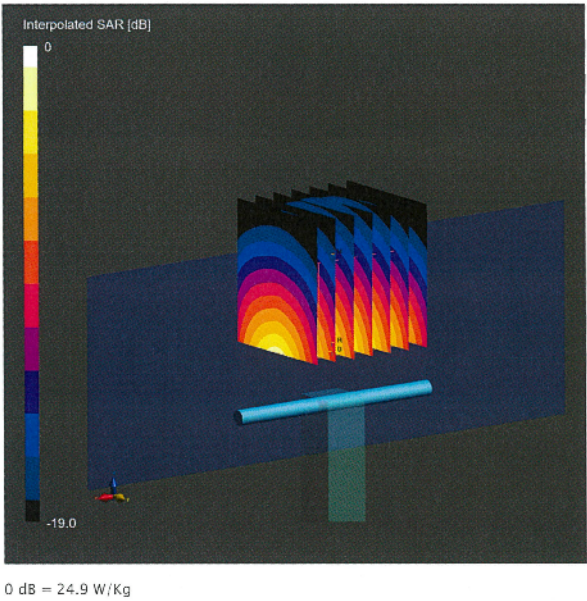
Impedance Measurement Plot for HSL



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System Performance Check Report

Summary								
Dipole	Frequency [MHz]			TSL	Power [dBm]			
D2450V2 - SN936	2450			MSL	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--	2450, 0	7.06	2.03	52.3	
Hardware Setup								
Phantom	TSL, Measured Date		Probe, Calibration Date			DAE, Calibration Date		
MFP V8.0 Center	MSL, 2025-06-18		EX3DV4 - SN7349, 2025-01-10			DAE4ip Sn1836, 2025-04-17		
Scans Setup				Measurement Results				
			Zoom Scan				Zoom Scan	
Grid Extents [mm]			30 x 30 x 30	Date			2025-06-18	
Grid Steps [mm]			5.0 x 5.0 x 1.5	psSAR1g [W/Kg]			12.7	
Sensor Surface [mm]			1.4	psSAR10g [W/Kg]			6.08	
Graded Grid			Yes	Power Drift [dB]			0.01	
Grading Ratio			1.5	Power Scaling			Disabled	
MAIA			N/A	Scaling Factor [dB]				
Surface Detection			VMS + 6p	TSL Correction			Positive / Negative	
Scan Method			Measured					



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Impedance Measurement Plot for MSL

