

Appendix C

Dipole Calibration Certificates

SPEAG CLA150 / 4010

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



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client **Motorola Solutions**
Bayan Lepas, Malaysia

Certificate No. **CLA150-4010_Jul24**

CALIBRATION CERTIFICATE

Object **CLA150 - SN: 4010**

Calibration procedure(s) **QA CAL-15.v11**
Calibration Procedure for SAR Validation Sources below 700 MHz

Calibration date: **July 16, 2024**

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 Calibration
Power meter NRP2	SN: 104778	26-Mar-24 (No. 217-04036/04037)	Mar-25
Power sensor NRP-Z91	SN: 103244	26-Mar-24 (No. 217-04036)	Mar-25
Power sensor NRP-Z91	SN: 103245	26-Mar-24 (No. 217-04037)	Mar-25
Reference 20 dB Attenuator	SN: CC2552 (20x)	26-Mar-24 (No. 217-04046)	Mar-25
Type-N mismatch combination	SN: 310982 / 06327	26-Mar-24 (No. 217-04047)	Mar-25
Reference Probe EX3DV4	SN: 3877	10-Jan-24 (No. EX3-3877_Jan24)	Jan-25
DAE4	SN: 654	15-Jan-24 (No. DAE4-654_Jan24)	Jan-25
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter NRP2	SN: 107193	08-Nov-21 (in house check Dec-22)	In house check: Dec-24
Power sensor NRP-Z91	SN: 100822	15-Dec-09 (in house check Dec-22)	In house check: Dec-24
Power sensor NRP-Z91	SN: 100418	01-Jan-04 (in house check Dec-22)	In house check: Dec-24
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-24)	In house check: Jun-26
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-22)	In house check: Oct-24

Calibrated by:	Name Krešimir Franjić	Function Laboratory Technician	Signature
Approved by:	Sven Kühn	Technical Manager	

Issued: July 16, 2024

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Certificate No: CLA150-4010_Jul24

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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 source is mounted in a touch configuration below the center marking of the flat phantom.
- Return Loss:** This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). 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 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	DASY5	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	ELI4 Flat Phantom	Shell thickness: 2 ± 0.2 mm
EUT Positioning	Touch Position	
Zoom Scan Resolution	$dx, dy = 4.0$ mm, $dz = 1.4$ mm	Graded Ratio = 1.4 (Z direction)
Frequency	150 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	52.3	0.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	50.9 ± 6 %	0.78 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	1 W input power	3.68 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	3.59 W/kg $\pm$ 18.4 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	1 W input power	2.44 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	2.38 W/kg $\pm$ 18.0 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	61.9	0.80 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	62.9 ± 6 %	0.81 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	1 W input power	3.86 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	3.84 W/kg $\pm$ 18.4 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	1 W input power	2.57 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	2.55 W/kg $\pm$ 18.0 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)**Antenna Parameters with Head TSL**

Impedance, transformed to feed point	48.0 Ω - 8.1 j Ω
Return Loss	- 21.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.8 Ω - 8.9 j Ω
Return Loss	- 21.1 dB

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 16.07.2024

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: CLA150; Type: CLA150; Serial: CLA150 - SN: 4010

Communication System: UID 0 - CW; Frequency: 150 MHz

Medium parameters used: $f = 150$ MHz; $\sigma = 0.78$ S/m; $\epsilon_r = 50.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3877; ConvF(12.11, 12.11, 12.11) @ 150 MHz; Calibrated: 10.01.2024
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 15.01.2024
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2034
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

CLA Calibration for HSL-LF Tissue/CLA150, touch configuration, Pin=1W/Zoom Scan, dist=1.4mm (8x10x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 81.87 V/m; Power Drift = -0.08 dB

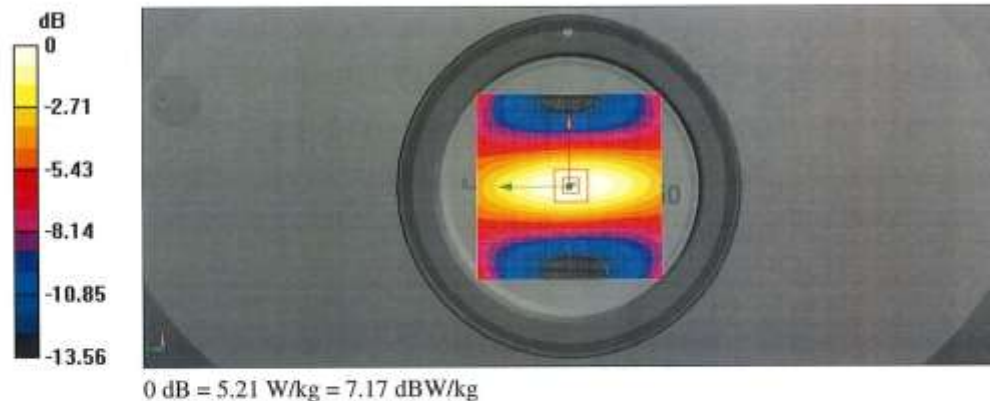
Peak SAR (extrapolated) = 7.03 W/kg

SAR(1 g) = 3.68 W/kg; SAR(10 g) = 2.44 W/kg

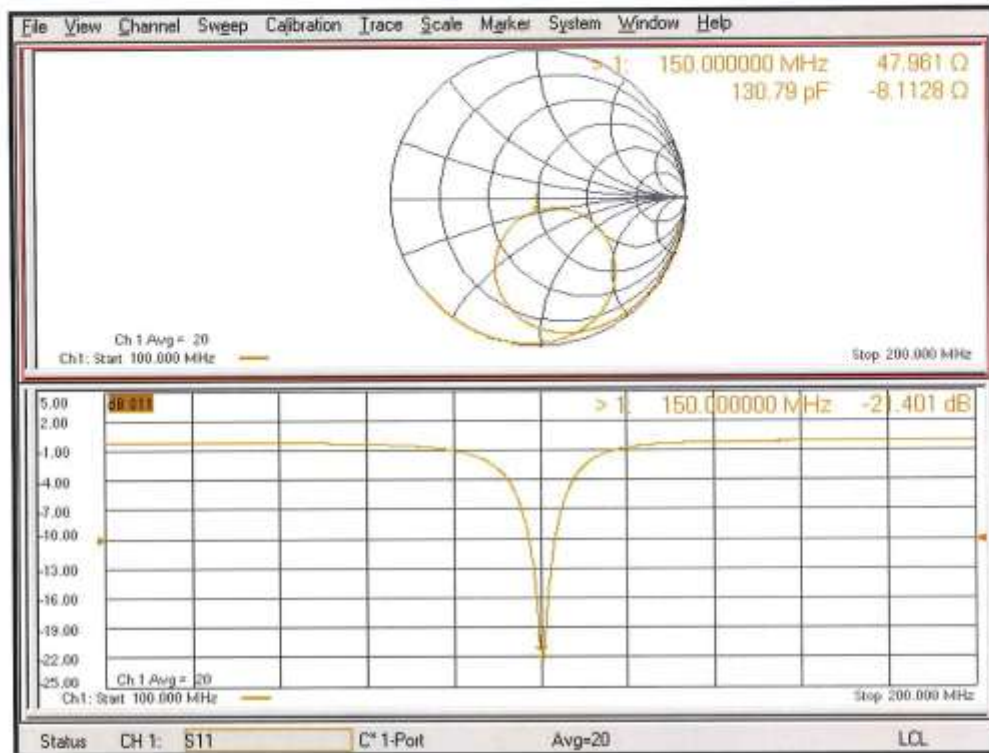
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid (> 14 mm)

Ratio of SAR at M2 to SAR at M1 = 80.1%

Maximum value of SAR (measured) = 5.21 W/kg



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 16.07.2024

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: CLA150; Type: CLA150; Serial: CLA150 - SN: 4010

Communication System: UID 0 - CW; Frequency: 150 MHz

Medium parameters used: $f = 150$ MHz; $\sigma = 0.81$ S/m; $\epsilon_r = 62.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3877; ConvF(11.56, 11.56, 11.56) @ 150 MHz; Calibrated: 10.01.2024
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 15.01.2024
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2034
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

CLA Calibration for MSL-LF Tissue/CLA150, touch configuration, Pin=1W/Zoom Scan,**dist=1.4mm (8x10x8)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 82.29 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 7.31 W/kg

SAR(1 g) = 3.86 W/kg; SAR(10 g) = 2.57 W/kg

Smallest distance from peaks to all points 3 dB below: Larger than measurement grid (> 14 mm)

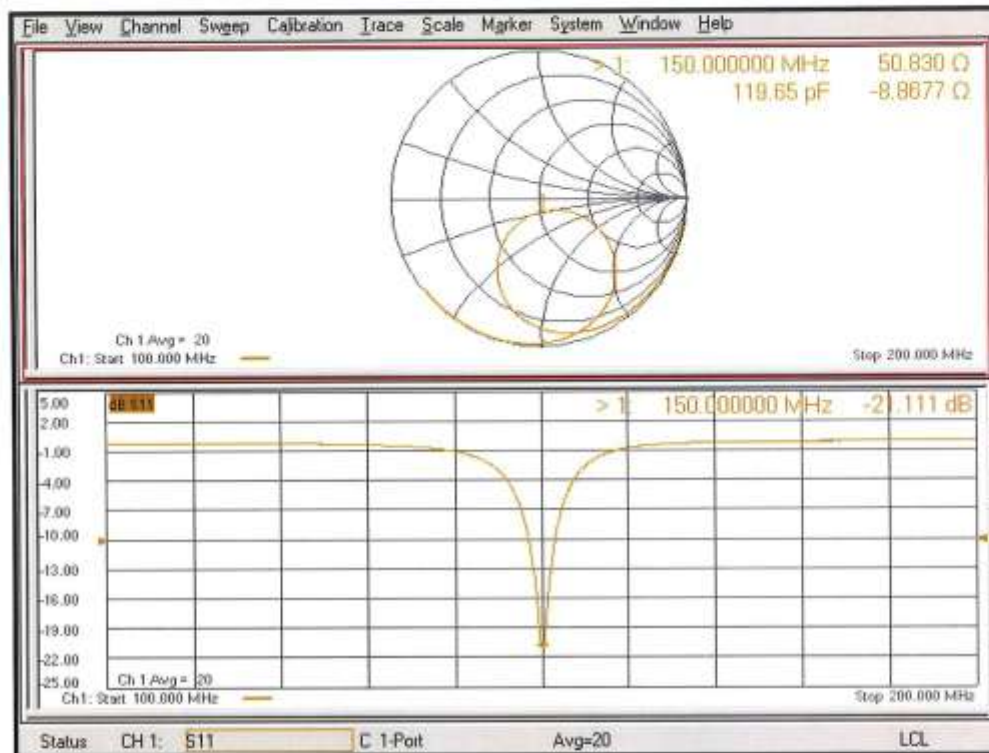
Ratio of SAR at M2 to SAR at M1 = 80.1%

Maximum value of SAR (measured) = 5.43 W/kg



0 dB = 5.43 W/kg = 7.35 dBW/kg

Impedance Measurement Plot for Body TSL



SPEAG D450V3 / 1077

24

**Calibration Laboratory of
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Accreditation No.: **SCS 0108**

Client **Motorola Solutions**
Bayan Lepas, Malaysia

Certificate No. **D450V3-1077_Jan25**

CALIBRATION CERTIFICATE

Object **D450V3 - SN:1077**

Calibration procedure(s) **QA CAL-15.v11**
Calibration Procedure for SAR Validation Sources below 700 MHz

Calibration date: **January 30, 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 Calibration
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Power sensor NRP-Z91	SN: 103244	26-Mar-24 (No. 217-04036)	Mar-25
Power sensor NRP-Z91	SN: 103245	26-Mar-24 (No. 217-04037)	Mar-25
Reference 20 dB Attenuator	SN: BH9394 (20k)	26-Mar-24 (No. 217-04046)	Mar-25
Type-N mismatch combination	SN: 310982 / 06327	26-Mar-24 (No. 217-04047)	Mar-25
Reference Probe EX3DV4	SN: 3877	06-Jan-25 (No. EX3-3877_Jan25)	Jan-26
DAE4	SN: 654	18-Oct-24 (No. DAE4-654_Oct24)	Oct-25
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter NRP2	SN: 107193	08-Nov-21 (in house check Jun-24)	In house check: Jun-26
Power sensor NRP-Z91	SN: 100922	15-Dec-09 (in house check Jun-24)	In house check: Jun-26
Power sensor NRP-Z91	SN: 100418	01-Jan-04 (in house check Jun-24)	In house check: Jun-26
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-24)	In house check: Jun-26
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Sep-24)	In house check: Sep-26

	Name	Function	Signature
Calibrated by:	Jeton Kastrali	Laboratory Technician	
Approved by:	Sven Kühn	Technical Manager	

Issued: January 31, 2025

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Certificate No: D450V3-1077_Jan25

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Accreditation No.: **SCS 0108**

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

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- 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 source is mounted in a touch configuration below the center marking of the flat phantom.
- Return Loss:** This parameter is measured with the source positioned under the liquid filled phantom (as described in the measurement condition clause). 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 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	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	ELI4 Flat Phantom	Shell thickness: 2 ± 0.2 mm
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	450 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	43.5	0.87 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	42.4 $\pm$ 6 %	0.87 mho/m $\pm$ 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	250 mW input power	1.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	4.53 W/kg $\pm$ 18.1 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	0.759 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	3.02 W/kg $\pm$ 17.6 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	56.7	0.94 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	56.6 $\pm$ 6 %	0.93 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.18 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	4.76 W/kg $\pm$ 18.1 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	0.799 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	3.22 W/kg $\pm$ 17.6 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)**Antenna Parameters with Head TSL**

Impedance, transformed to feed point	57.6 Ω - 2.9 j Ω
Return Loss	- 22.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	54.1 Ω - 7.9 j Ω
Return Loss	- 21.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.350 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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DASY5 Validation Report for Head TSL

Date: 30.01.2025

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 450 MHz; Type: D450V3; Serial: D450V3 - SN:1077

Communication System: UID 0 - CW; Frequency: 450 MHz

Medium parameters used: $f = 450$ MHz; $\sigma = 0.87$ S/m; $\epsilon_r = 42.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3877; ConvF(10.79, 10.79, 10.79) @ 450 MHz; Calibrated: 06.01.2025
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 18.10.2024
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2034
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 39.07 V/m; Power Drift = -0.00 dB

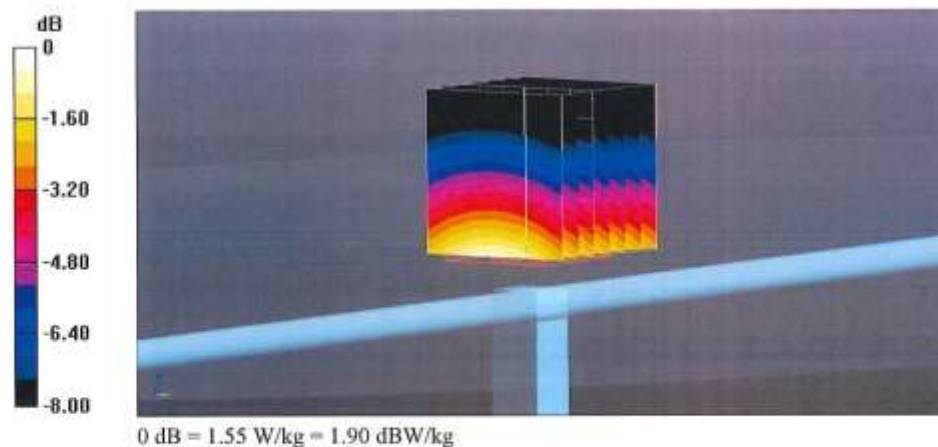
Peak SAR (extrapolated) = 1.80 W/kg

SAR(1 g) = 1.14 W/kg; SAR(10 g) = 0.759 W/kg

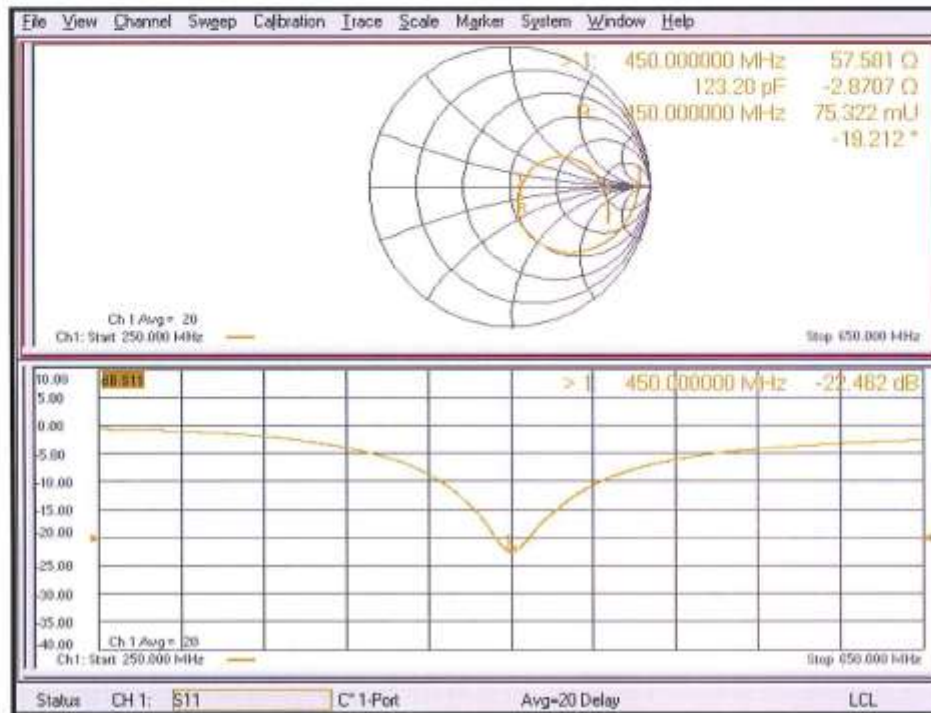
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid (> 15 mm)

Ratio of SAR at M2 to SAR at M1 = 63.5%

Maximum value of SAR (measured) = 1.55 W/kg



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 30.01.2025

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 450 MHz; Type: D450V3; Serial: D450V3 - SN:1077

Communication System: UID 0 - CW; Frequency: 450 MHz

Medium parameters used: $f = 450$ MHz; $\sigma = 0.93$ S/m; $\epsilon_r = 56.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3877; ConvF(10.75, 10.75, 10.75) @ 450 MHz; Calibrated: 06.01.2025
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 18.10.2024
- Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2034
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Body Tissue/d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 42.88 V/m; Power Drift = -0.03 dB

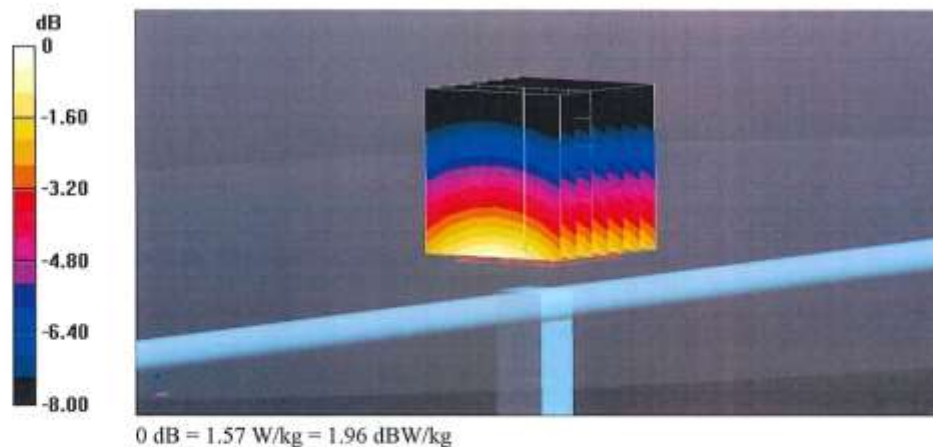
Peak SAR (extrapolated) = 1.80 W/kg

SAR(1 g) = 1.18 W/kg; SAR(10 g) = 0.799 W/kg

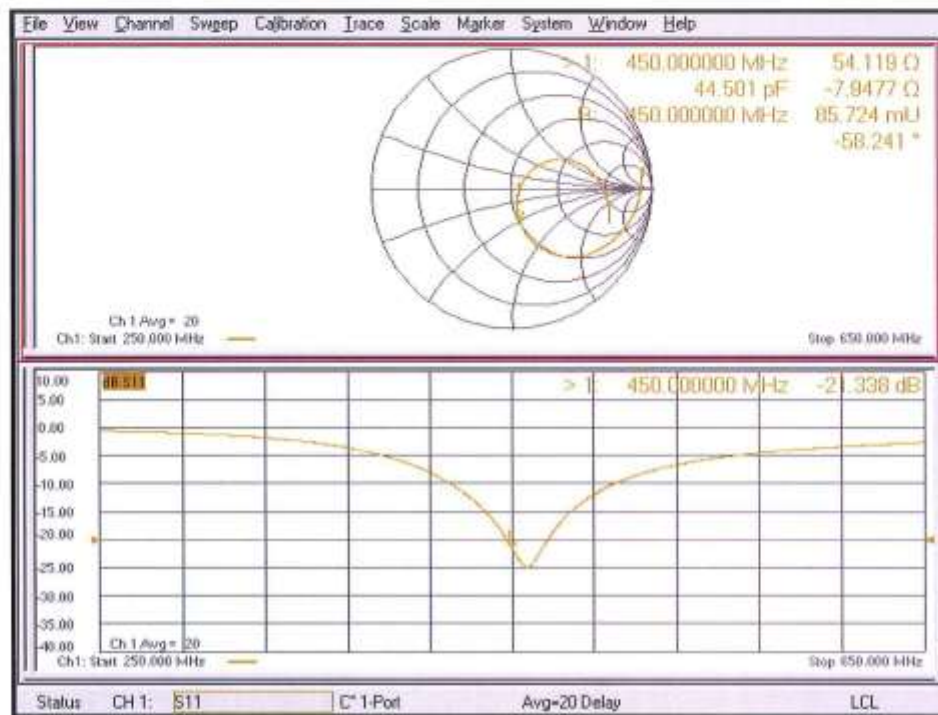
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid (> 15 mm)

Ratio of SAR at M2 to SAR at M1 = 65.9%

Maximum value of SAR (measured) = 1.57 W/kg



Impedance Measurement Plot for Body TSL



SPEAG D750V3 / 1098

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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%.

D750V3 - SN: 1098

November 20, 2024

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	15 mm	with spacer
Zoom Scan Resolution	dx, dy = 6mm, dz = 1.5mm	Graded Ratio = 1.5 mm (Z direction)
Frequency	750MHz $\pm$ 1MHz	

Head TSL parameters at 750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.890 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2)°C	43.2 $\pm$ 6%	0.890 mho/m $\pm$ 6%
Head TSL temperature change during test	< 0.5 °C		

SAR result with Head TSL at 750 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	2.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.52 W/kg $\pm$ 17.0% (k = 2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	1.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.57 W/kg $\pm$ 16.5% (k = 2)

D750V3 - SN: 1098

November 20, 2024

Body TSL parameters at 750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.5	0.960 mho/m
Measured Body TSL parameters	(22.0 ±0.2)°C	55.9 ±6%	0.950 mho/m ±6%
Body TSL temperature change during test	< 0.5 °C		

SAR result with Body TSL at 750 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR for nominal Body TSL parameters	24 dBm input power	2.27 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	9.04 W/kg ±17.0% (k = 2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	Condition	
SAR for nominal Body TSL parameters	24 dBm input power	1.49 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	5.93 W/kg ±16.5% (k = 2)

D750V3 - SN: 1098

November 20, 2024

Appendix (Additional assessments outside the scope of SCS 0108)**Antenna Parameters with Head TSL at 750 MHz**

Impedance	55.9 Ω + 0.7 j Ω
Return Loss	-25.0 dB

Antenna Parameters with Body TSL at 750 MHz

Impedance	51.6 Ω - 0.9 j Ω
Return Loss	-34.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.035 ns
----------------------------------	----------

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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D750V3 - SN: 1098

November 20, 2024

System Performance Check Report

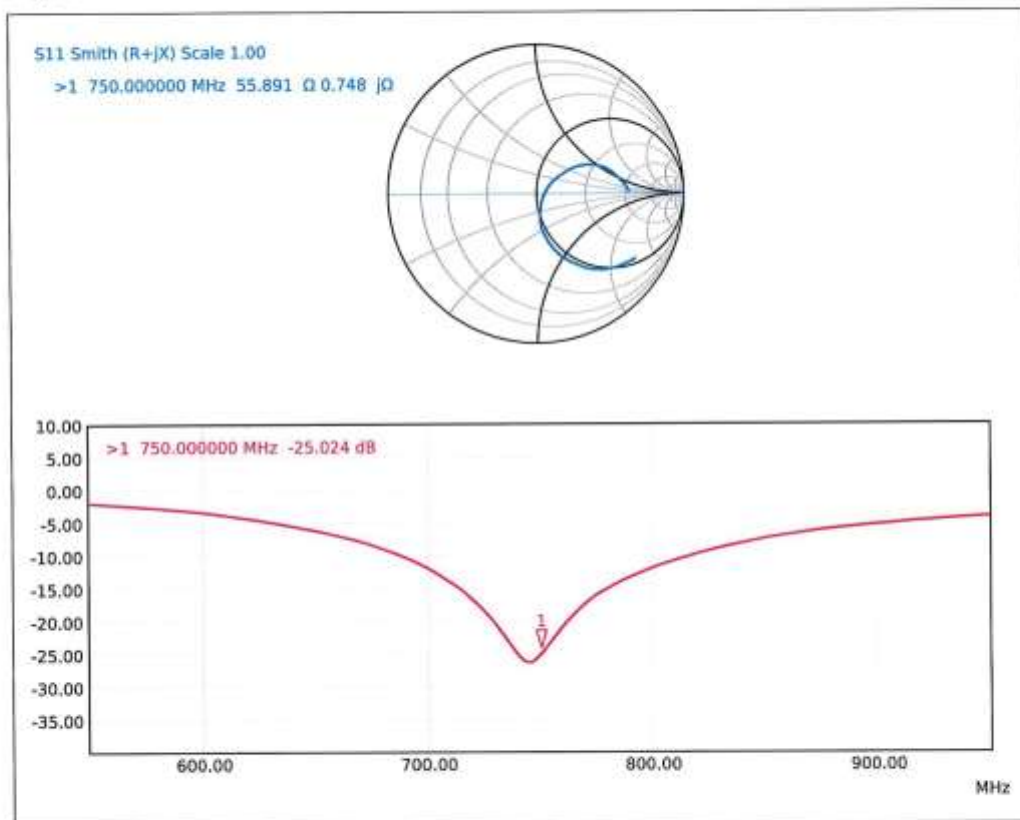
Summary								
Dipole		Frequency [MHz]			TSL	Power [dBm]		
D750V3 - SN1098		750			HSL	24		
Exposure Conditions								
Phantom Section, TSL	Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number		Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat	15		CW, 0--	750, 0		0.83	0.89	43.2
Hardware Setup								
Phantom	TSL, Measured Date			Probe, Calibration Date			DAE, Calibration Date	
Flat V4.9 mod	HSL, 2024-11-04			EX30V4 - SN7148, 2024-08-03			DAE4ip Sn1836, 2024-10-28	
Scans Setup				Measurement Results				
				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				
				Date				
				2024-11-04				
				psSAR1g [W/Kg]				
				2.14				
				psSAR10g [W/Kg]				
				1.40				
				Power Drift [dB]				
				0.00				
				Power Scaling				
				Disabled				
				Scaling Factor [dB]				
				TSL Correction				
				Positive / Negative				



D750V3 - SN: 1098

November 20, 2024

Impedance Measurement Plot for Head TSL



D750V3 - SN: 1098

November 20, 2024

System Performance Check Report

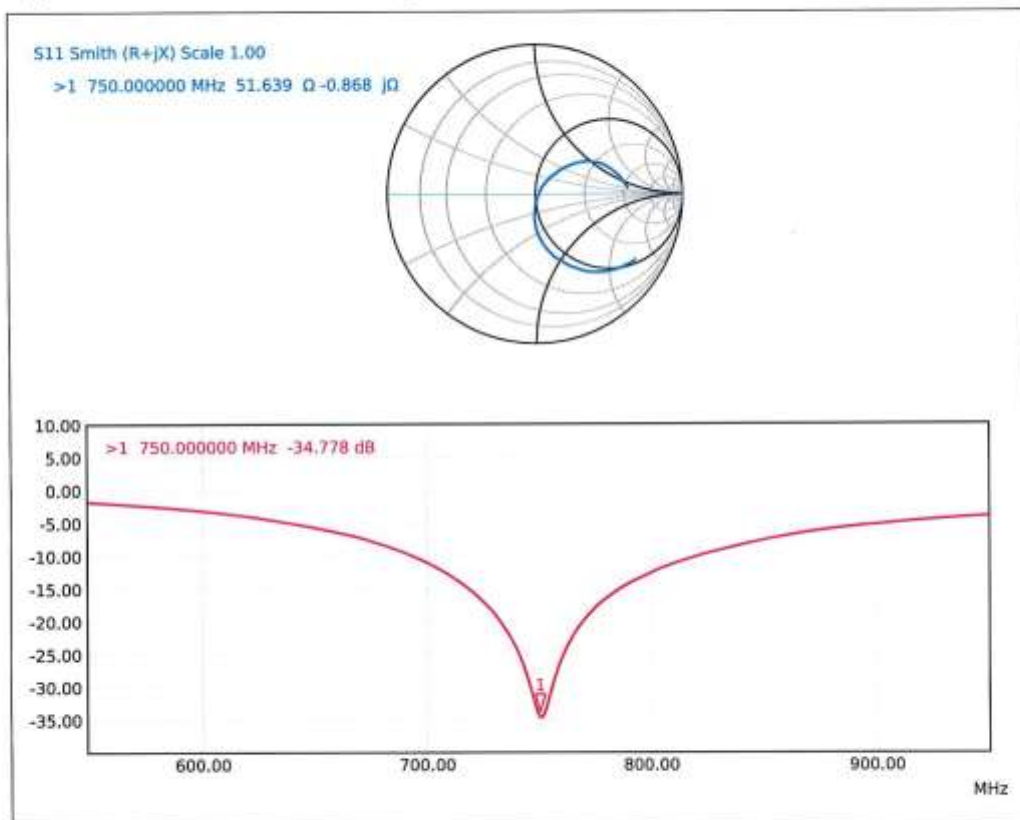
Summary								
Dipole	Frequency (MHz)			TSL	Power (dBm)			
D750V3 – SN1098	750			MSL	24			
Exposure Conditions								
Phantom Section, TSL	Test Distance (mm)	Band	Group, UID	Frequency (MHz), Channel Number		Conversion Factor	TSL Conductivity (S/m)	TSL Permittivity
Flat	15		CW, 0--	750, 0		10.43	0.95	55.9
Hardware Setup								
Phantom	TSL, Measured Date		Probe, Calibration Date			DAE, Calibration Date		
Flat V4.9 mod	MSL, 2024-11-20		EX3DV4 – SN7349, 2024-06-03			DAE4ip Sn1836, 2024-10-28		
Scans Setup				Measurement Results				
				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 + Gp				
Scan Method				Measured				
				Date				
				2024-11-20				
				psSAR1g (W/Kg)				
				2.27				
				psSAR10g (W/Kg)				
				1.49				
				Power Drift (dB)				
				0.03				
				Power Scaling				
				Disabled				
				Scaling Factor (dB)				
				TSL Correction				
				Positive / Negative				



D750V3 - SN: 1098

November 20, 2024

Impedance Measurement Plot for Body TSL



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Accreditation No.: **SCS 0108**

Client **Motorola Solutions**
Bayan Lepas, Malaysia

Certificate No. **D750V3-1098_Nov24**

CALIBRATION CERTIFICATE

Object **D750V3 - SN: 1098**

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

Calibration date **November 20, 2024**

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	28-Mar-24 (No. 217-04038)	Mar-25
Power Sensor R&S NRP18A	SN: 101859	22-Jul-24 (No. 4030A315008547)	Jul-25
Spectrum Analyzer R&S FSV40	SN: 101832	25-Jan-24 (No. 4030-315007551)	Jan-25
Mismatch; Short [S4188] Attenuator [S4423]	SN: 1152	28-Mar-24 (No. 217-04050)	Mar-25
OCP DAK-12	SN: 1016	24-Sep-24 (No. OCP-DAK12-1016_Sep24)	Sep-25
OCP DAK-3.5	SN: 1249	23-Sep-24 (No. OCP-DAK3.5-1249_Sep24)	Sep-25
Reference Probe EX3DV4	SN: 7349	03-Jun-24 (No. EX3-7349_Jun24)	Jun-25
DAE4ip	SN: 1836	28-Oct-24 (No. DAE4ip-1836_Oct24)	Oct-25

Secondary Standards	ID	Check Date (in house)	Scheduled Check
ACAD Source Box	SN: 1000	28-May-24 (No. 675-ACAD_Source_Box-240528)	May-25
Signal Generator R&S SMB100A	SN: 182081	28-May-24 (No. 675-CAL16-S4588-240528)	May-25
Mismatch; SMA	SN: 1102	22-May-24 (No. 675-Mismatch_SMA-240522)	May-25

	Name	Function	Signature
Calibrated by	Paulo Pina	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	

Issued: November 20, 2024

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Certificate No: D750V3-1098_Nov24

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SPEAG D750V3 / 1142

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Accreditation No.: SCS 0108

Client

Motorola Solutions

Bayan Lepas, Malaysia

Certificate No.

D750V3-1142_Oct25**CALIBRATION CERTIFICATE**

Object

D750V3 - SN: 1142

Calibration procedure(s)

QA CAL-05.v13

Calibration Procedure for SAR Validation Sources between 0.7 - 3 GHz

Calibration date

October 2, 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	30-Apr-25 (No. 1020-300791789)	Apr-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	16-Sept-25 (No. OCP-DAK12-1016_Sep25)	Sep-26
OCP DAK-3.5	SN: 1249	16-Sept-25 (No. OCP-DAK3.5-1249_Sep25)	Sep-26
Reference Probe EX3DV4	SN: 7349	10-Jan-25 (No. EX3-7349_Jan25)	Jan-26
DAE4lp	SN: 1836	04-Sep-25 (No. DAE4lp-1836_Sep25)	Sep-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	Paulo Pina	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	
Issued: October 2, 2025			
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Certificate No: D750V3-1142_Oct25

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 Multilateral Agreement for the recognition of calibration certificates

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%.

D750V3 - SN: 1142

October 2, 2025

Measurement Conditions

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

DASY Version	DASY8 Module SAR	17.0.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with spacer
Zoom Scan Resolution	dx, dy = 6mm, dz = 1.5mm	Graded Ratio = 1.5 mm (Z direction)
Frequency	750MHz $\pm$ 1MHz	

HSL parameters at 750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal HSL parameters	22.0 °C	41.9	0.890 mho/m
Measured HSL parameters	(22.0 $\pm$ 0.2) °C	42.6 $\pm$ 6%	0.890 mho/m $\pm$ 6%
HSL temperature change during test	< 0.5 °C		

SAR result with HSL at 750 MHz

SAR averaged over 1 cm ³ (1 g) of HSL	Condition	
SAR for nominal HSL parameters	24 dBm input power	2.15 W/kg
SAR for nominal HSL parameters	normalized to 1W	8.56 W/kg $\pm$ 17.0% (k = 2)

SAR averaged over 10 cm ³ (10 g) of HSL	Condition	
SAR for nominal HSL parameters	24 dBm input power	1.40 W/kg
SAR for nominal HSL parameters	normalized to 1W	5.57 W/kg $\pm$ 16.5% (k = 2)

D750V3 - SN: 1142

October 2, 2025

MSL parameters at 750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal MSL parameters	22.0 °C	55.5	0.960 mho/m
Measured MSL parameters	(22.0 ±0.2)°C	55.6 ±6%	0.960 mho/m ±6%
MSL temperature change during test	< 0.5 °C		

SAR result with MSL at 750 MHz

SAR averaged over 1 cm ³ (1 g) of MSL	Condition	
SAR for nominal MSL parameters	24 dBm input power	2.19 W/kg
SAR for nominal MSL parameters	normalized to 1W	8.72 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	1.44 W/kg
SAR for nominal MSL parameters	normalized to 1W	5.73 W/kg ±16.5% (k = 2)

D750V3 - SN: 1142

October 2, 2025

Appendix (Additional assessments outside the scope of SCS 0108)**Antenna Parameters with HSL at 750 MHz**

Impedance	54.4 Ω – 3.3 j Ω
Return Loss	-25.7 dB

Antenna Parameters with MSL at 750 MHz

Impedance	49.6 Ω – 5.5 j Ω
Return Loss	-25.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.035 ns
----------------------------------	----------

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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D750V3 - SN: 1142

October 2, 2025

System Performance Check Report

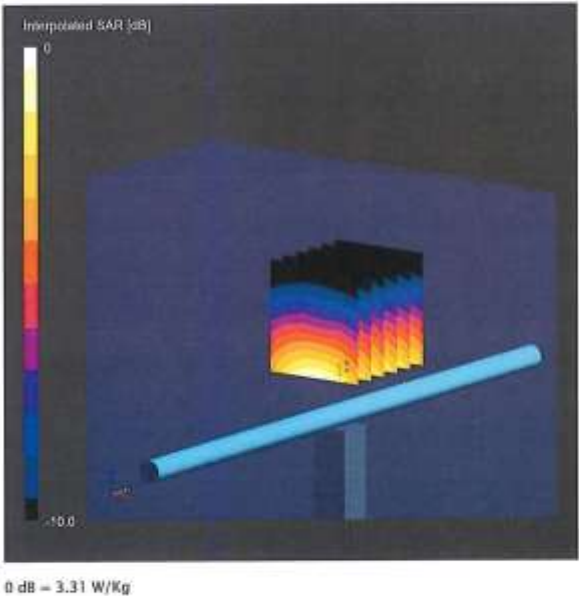
Summary			
Dipole	Frequency [MHz]	TSL	Power [dBm]
D750V3 - SN:1142	750	HSL	24

Exposure Conditions						
Phantom Section, TSL	Test Distance [mm]	Band	Group, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]
Flat	15	CW, 0--		750, 0	9.55	0.89
						42.6

Hardware Setup			
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
Flat V4.9 mod	HSL, 2025-10-01	EX3DV4 - SN7949, 2025-01-10	DAE4ip Sn1836, 2025-09-04

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 + Ep
Scan Method	Measured

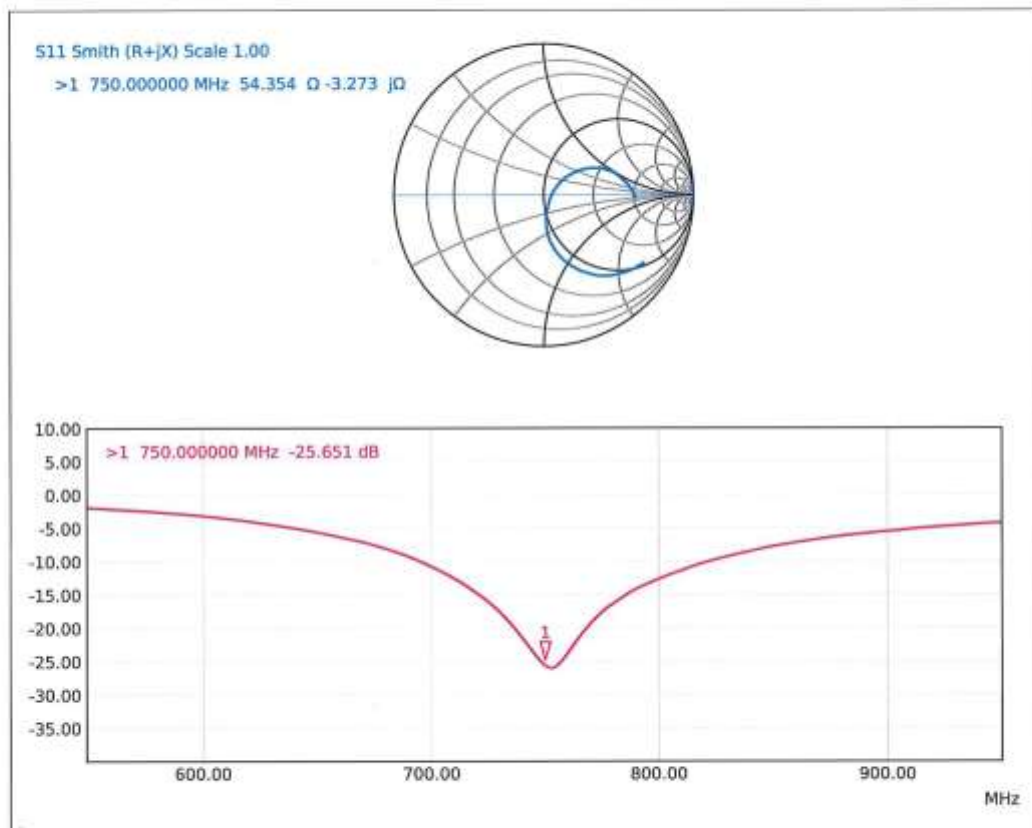
Measurement Results	
	Zoom Scan
Date	2025-10-01
psSAR1g [W/Kg]	2.15
psSAR10g [W/Kg]	1.40
Power Drift [dB]	0.01
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



D750V3 - SN: 1142

October 2, 2025

Impedance Measurement Plot for HSL



D750V3 - SN: 1142

October 2, 2025

System Performance Check Report

Summary

Dipole	Frequency [MHz]	TSL	Power [dBm]
D750V3 - SN1142	750	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	15	CW, 0-1		750, 0	9.7	0.96	55.6

Hardware Setup

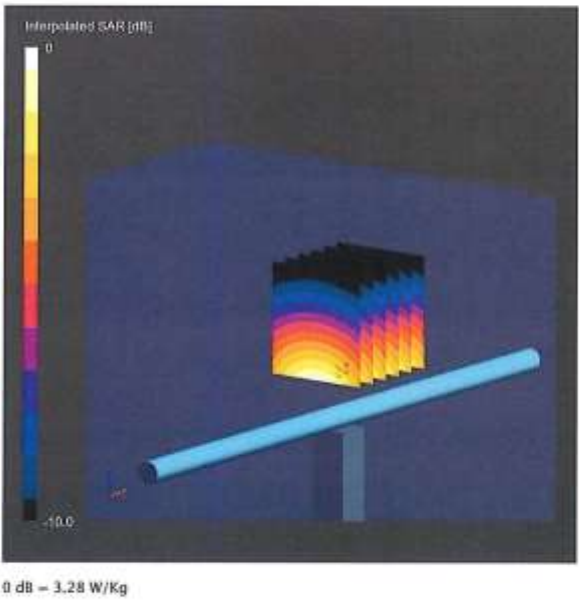
Phantom	TSL, Measured Date	Probe, Calibration Date	DAC, Calibration Date
Flat V4.9 mod	MSL, 2025-10-02	EX3DV4 - SN7549, 2025-01-10	DNE4p Sn1836, 2025-09-04

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 + Ep
Scan Method	Measured

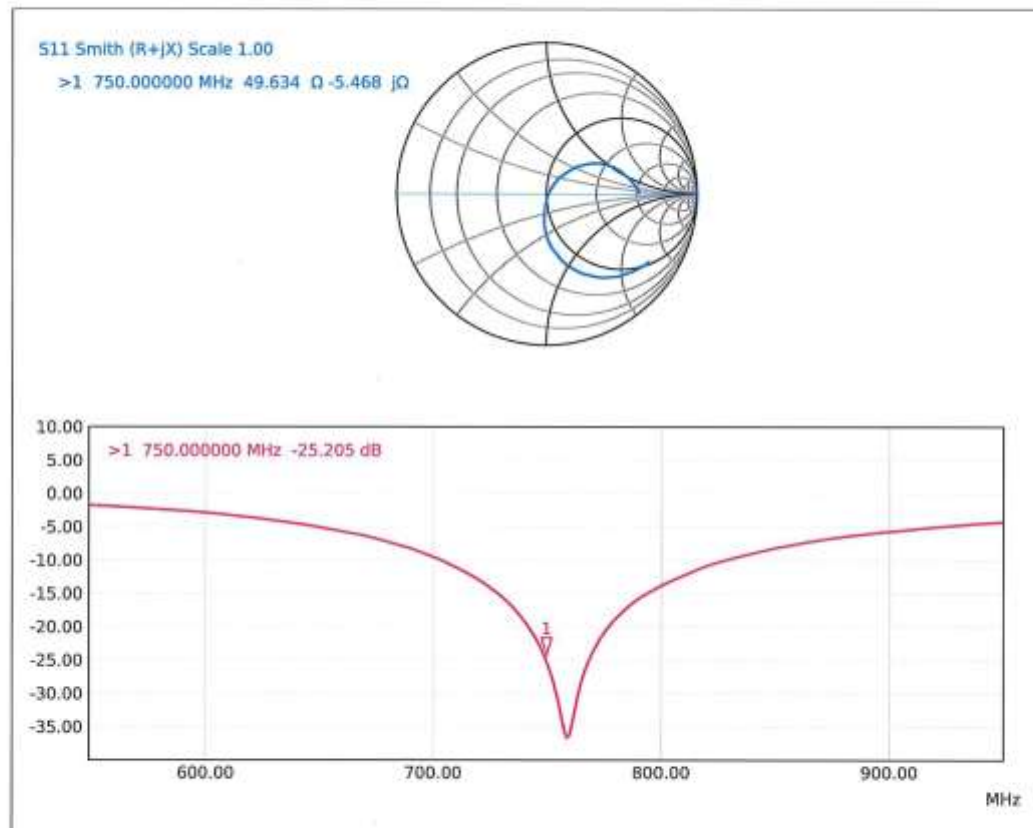
Measurement Results

	Zoom Scan
Date	2025-10-02
psSAR1g [W/Kg]	2.19
psSAR10g [W/Kg]	1.44
Power Drift [dB]	0.00
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



D750V3 - SN: 1142

October 2, 2025

Impedance Measurement Plot for MSL

SPEAG D835V2 / 4d030

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Accreditation No.: **SCS 0108**

Client

Motorola Solutions
 Bayan Lepas, Malaysia

Certificate No.

D835V2-4d030_Apr26

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d030**

Calibration procedure(s) **QA CAL-05.v13**
Calibration Procedure for SAR Validation Sources between 0.7 - 3 GHz

Calibration date **April 24, 2026**

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 NRP40T	SN: 101861	29-Apr-25 (No. 2025-001450)	Apr-26
Power Sensor R&S NRP18AN	SN: 100961	22-Aug-25 (No. 4030A315010971)	Aug-26
Spectrum Analyzer R&S FSV40	SN: 101832	23-Jan-26 (No. 4030A315011865)	Jan-27
3.5mm mismatch combination	SN: 1152	24-Mar-26 (No. 2026-005594)	Mar-27
OCP DAK-12	SN: 1016	16-Sept-25 (No. OCP-DAK12-1016_Sep25)	Sep-26
OCP DAK-3.5	SN: 1249	16-Sept-25 (No. OCP-DAK3.5-1249_Sep25)	Sep-26
Reference Probe EX3DV4	SN: 7349	29-Jan-26 (No. EX3-7349_Jan26)	Jan-27
DAE4ip	SN: 1836	18-Feb-26 (No. DAE4ip-1836_Feb26)	Feb-27

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	24-Feb-26 (No. OCP-DAK12-1029_Feb26)	Feb-27
OCP DAK-3.5	SN: 1336	10-Dec-25 (No. OCP-DAK3.5-1336_Dec25)	Dec-26

	Name	Function	Signature
Calibrated by	Paulo Pina	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	
Issued: April 24, 2026			
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Certificate No: D835V2-4d030_Apr26

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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****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%.

D835V2 - SN: 4d030

April 24, 2026

Measurement Conditions

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

DASY Version	DASY8 Module SAR	17.0.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with spacer
Frequency	835MHz $\pm$ 1MHz	

HSL parameters at 835 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal HSL parameters	22.0 °C	41.5	0.90 mho/m
Measured HSL parameters	(22.0 $\pm$ 0.2) °C	41.7 $\pm$ 6%	0.92 mho/m $\pm$ 6%
HSL temperature change during test	< 0.5 °C		

SAR result with HSL at 835 MHz

SAR averaged over 1 cm³ (1 g) of HSL	Condition	
SAR for nominal HSL parameters	24 dBm input power	2.43 W/kg
SAR for nominal HSL parameters	normalized to 1W	9.67 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	1.59 W/kg
SAR for nominal HSL parameters	normalized to 1W	6.33 W/kg $\pm$ 16.5% (k = 2)

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April 24, 2026

MSL parameters at 835 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal MSL parameters	22.0 °C	55.2	0.97 mho/m
Measured MSL parameters	(22.0 ±0.2)°C	55.2 ±6%	0.99 mho/m ±6%
MSL temperature change during test	< 0.5 °C		

SAR result with MSL at 835 MHz

SAR averaged over 1 cm ³ (1 g) of MSL	Condition	
SAR for nominal MSL parameters	24 dBm input power	2.46 W/kg
SAR for nominal MSL parameters	normalized to 1W	9.79 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	1.65 W/kg
SAR for nominal MSL parameters	normalized to 1W	6.57 W/kg ±16.5% (k = 2)

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Appendix (Additional assessments outside the scope of SCS 0108)**Antenna Parameters with HSL at 835 MHz**

Impedance	53.5 Ω – 1.3 j Ω
Return Loss	-28.8 dB

Antenna Parameters with MSL at 835 MHz

Impedance	47.7 Ω – 4.3 j Ω
Return Loss	-26.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.386 ns
----------------------------------	----------

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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D835V2 - SN: 4d030

April 24, 2026

System Performance Check Report

Summary

Dipole	Frequency [MHz]	TSL	Power [dBm]
D835V2 - SN4d030	835	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	15	CW, 0--		835, 0	9.6	0.92	41.7

Hardware Setup

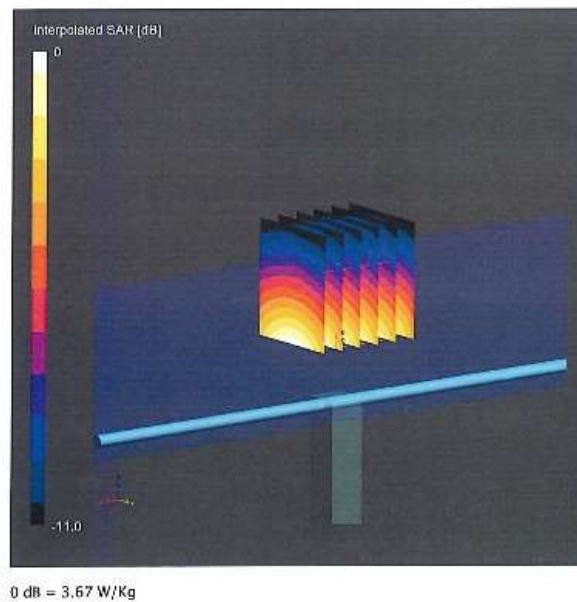
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
MFP V8.0 Center	HSL, 2026-04-23	EX3DV4 - SN7349, 2026-01-29	DAE4ip Sn1836, 2026-02-18

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 + 6ip
Scan Method	Measured

Measurement Results

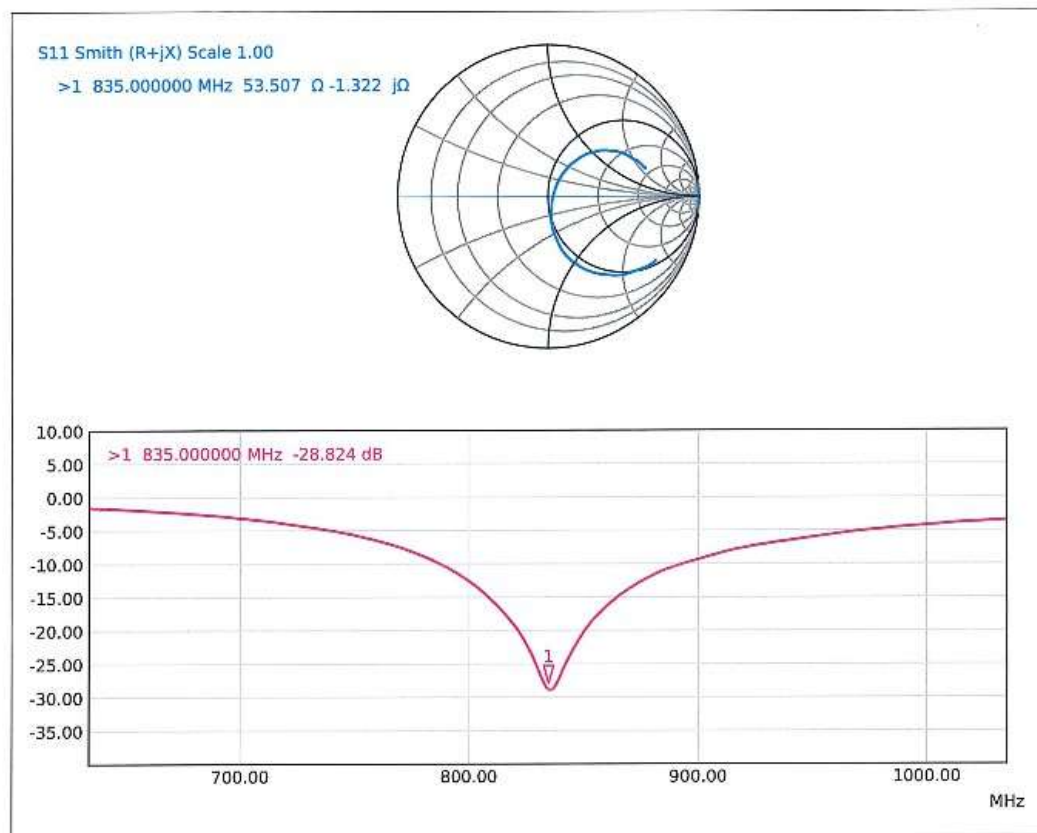
	Zoom Scan
Date	2026-04-23
psSAR1g [W/Kg]	2.43
psSAR10g [W/Kg]	1.59
Power Drift [dB]	0.00
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



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Impedance Measurement Plot for HSL



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D835V2 - SN: 4d030

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System Performance Check Report

Summary

Dipole	Frequency [MHz]	TSL	Power [dBm]
D835V2 - SN4d030	835	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	15	CW, 0--	835, 0		9.39	0.99	55.2

Hardware Setup

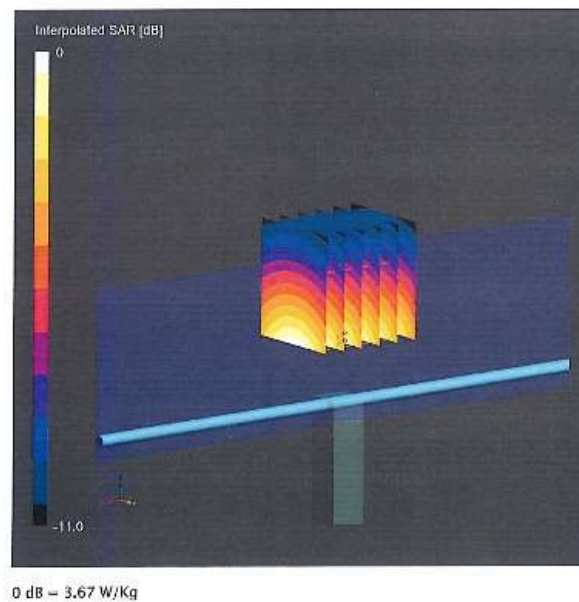
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
MFP V8.0 Center	MSL, 2026-04-24	DX3DV4 - SN7349, 2026-01-29	DAE4lp Sn1836, 2026-02-18

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
MAMA	N/A
Surface Detection	VMS + 6p
Scan Method	Measured

Measurement Results

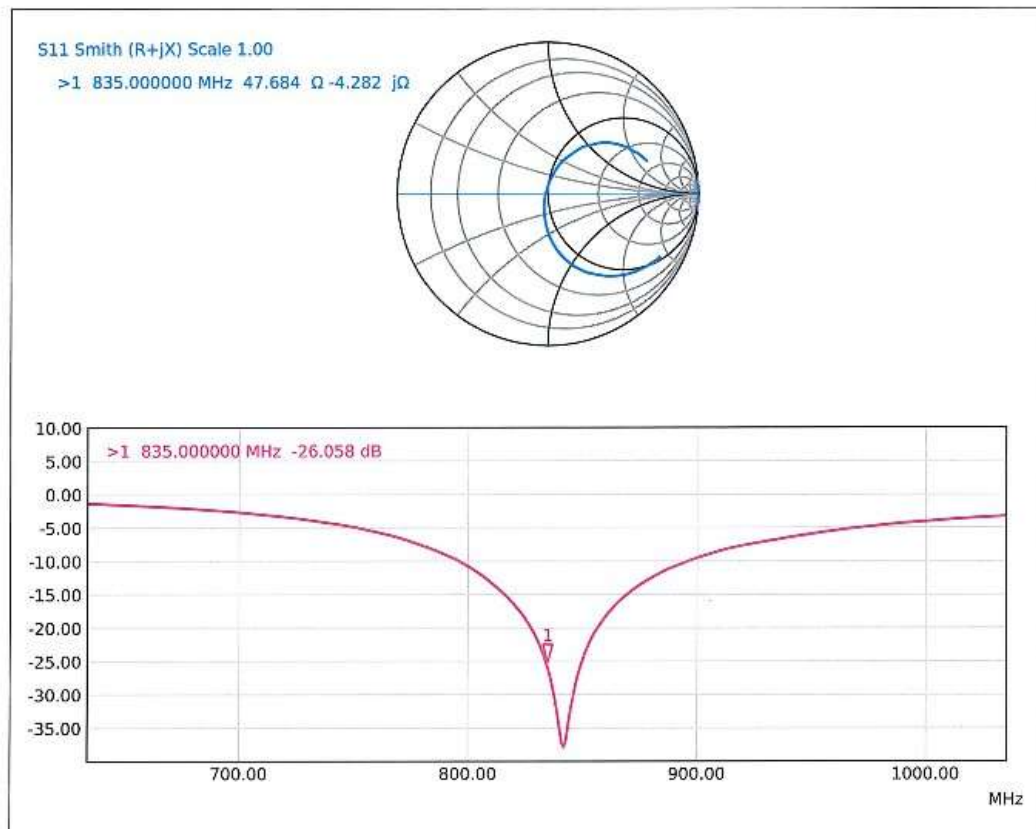
	Zoom Scan
Date	2026-04-24
psSAR1g [W/Kg]	2.46
psSAR10g [W/Kg]	1.65
Power Drift [dB]	0.00
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



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April 24, 2026

Impedance Measurement Plot for MSL



Certificate No: D835V2-4d030_Apr26

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SPEAG D835V2 / 4d029

**Calibration Laboratory of
Schmid & Partner
Engineering AG**

Zoughausstrasse 43, 8004 Zurich, Switzerland



S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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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 **Motorola Solutions**
Bayan Lepas, Malaysia

Certificate No. **D835V2-4d029_Apr26**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d029**

Calibration procedure(s) **QA CAL-05.v13**
Calibration Procedure for SAR Validation Sources between 0.7 - 3 GHz

Calibration date **April 24, 2026**

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 NRP40T	SN: 101861	29-Apr-25 (No. 2025-001450)	Apr-26
Power Sensor R&S NRP18AN	SN: 100961	22-Aug-25 (No. 4030A315010971)	Aug-26
Spectrum Analyzer R&S FSV40	SN: 101832	23-Jan-26 (No. 4030A315011865)	Jan-27
3.5mm mismatch combination	SN: 1152	24-Mar-26 (No. 2026-005594)	Mar-27
OCP DAK-12	SN: 1016	16-Sept-25 (No. OCP-DAK12-1016_Sep25)	Sep-26
OCP DAK-3.5	SN: 1249	16-Sept-25 (No. OCP-DAK3.5-1249_Sep25)	Sep-26
Reference Probe EX3DV4	SN: 7349	29-Jan-26 (No. EX3-7349_Jan26)	Jan-27
DAE4ip	SN: 1836	18-Feb-26 (No. DAE4ip-1836_Feb26)	Feb-27

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	24-Feb-26 (No. OCP-DAK12-1029_Feb26)	Feb-27
OCP DAK-3.5	SN: 1336	10-Dec-25 (No. OCP-DAK3.5-1336_Dec25)	Dec-26

	Name	Function	Signature
Calibrated by	Paulo Pina	Laboratory Technician	
Approved by	Sven Kühn	Technical Manager	
Issued: April 24, 2026			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			

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Calibration Laboratory ofSchmid & Partner
Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland



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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%.

D835V2 - SN: 4d029

April 24, 2026

Measurement Conditions

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

DASY Version	DASY8 Module SAR	17.0.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with spacer
Frequency	835MHz $\pm$ 1MHz	

HSL parameters at 835 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal HSL parameters	22.0 °C	41.5	0.90 mho/m
Measured HSL parameters	(22.0 $\pm$ 0.2)°C	41.7 $\pm$ 6%	0.92 mho/m $\pm$ 6%
HSL temperature change during test	< 0.5 °C		

SAR result with HSL at 835 MHz

SAR averaged over 1 cm³ (1 g) of HSL	Condition	
SAR for nominal HSL parameters	24 dBm input power	2.42 W/kg
SAR for nominal HSL parameters	normalized to 1W	9.63 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	1.59 W/kg
SAR for nominal HSL parameters	normalized to 1W	6.33 W/kg $\pm$ 16.5% (k = 2)

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MSL parameters at 835 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal MSL parameters	22.0 °C	55.2	0.97 mho/m
Measured MSL parameters	(22.0 ± 0.2)°C	55.2 ± 6%	0.99 mho/m ± 6%
MSL temperature change during test	< 0.5 °C		

SAR result with MSL at 835 MHz

SAR averaged over 1 cm ³ (1 g) of MSL	Condition	
SAR for nominal MSL parameters	24 dBm input power	2.49 W/kg
SAR for nominal MSL parameters	normalized to 1W	9.91 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	1.67 W/kg
SAR for nominal MSL parameters	normalized to 1W	6.65 W/kg ± 16.5% (k = 2)

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April 24, 2026

Appendix (Additional assessments outside the scope of SCS 0108)**Antenna Parameters with HSL at 835 MHz**

Impedance	$51.5 \Omega - 2.0 j\Omega$
Return Loss	-32.0 dB

Antenna Parameters with MSL at 835 MHz

Impedance	$46.8 \Omega - 4.6 j\Omega$
Return Loss	-24.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.387 ns
----------------------------------	----------

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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D835V2 - SN: 4d029

April 24, 2026

System Performance Check Report

Summary

Dipole	Frequency [MHz]	TSL	Power [dBm]
D835V2 - SN4d029	835	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	15	CW, 0--		835, 0	9.6	0.92	41.7

Hardware Setup

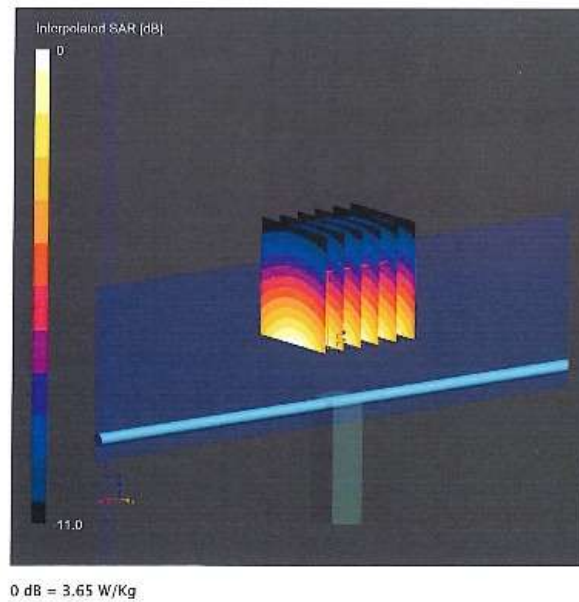
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
MFP V8.0 Center	HSL, 2026-04-23	EX3DV4 - SN7349, 2026-01-29	DAE/np Sn1836, 2026-02-18

Scans Setup

	Zoom Scan
Grid Exents [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	2026-04-23
psSAR1q [W/Kg]	2.42
psSAR10g [W/Kg]	1.39
Power Drift [dB]	0.00
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



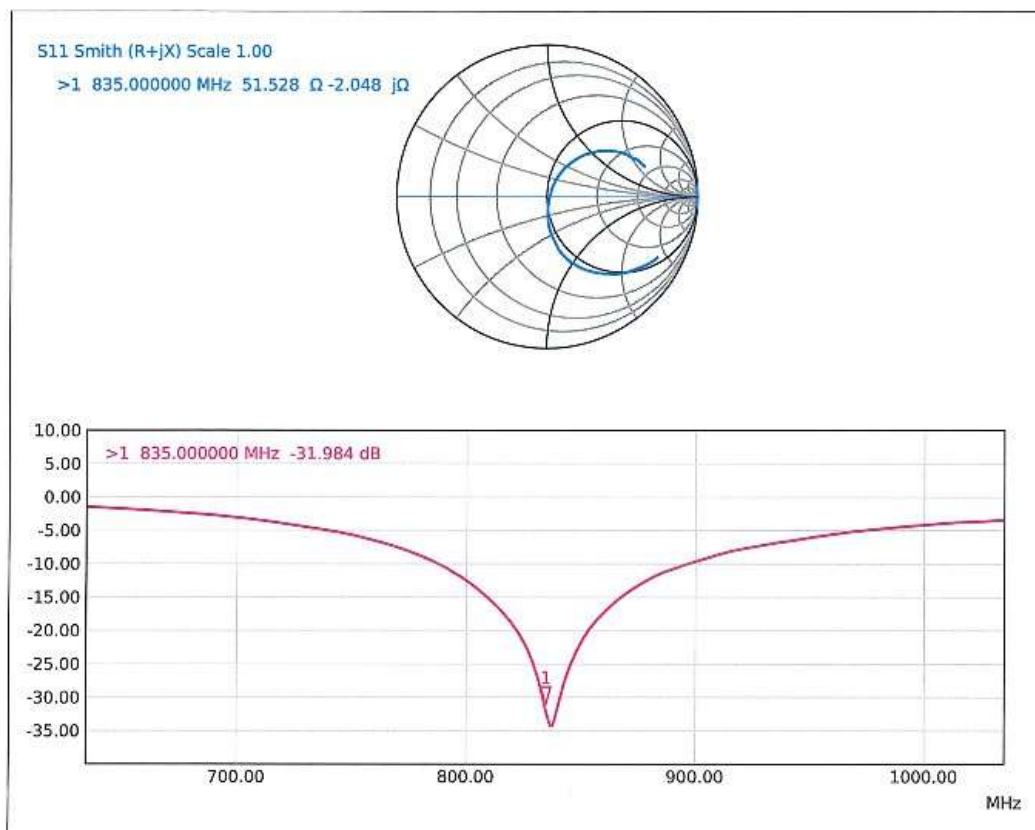
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D835V2 - SN: 4d029

April 24, 2026

Impedance Measurement Plot for HSL



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System Performance Check Report

Summary

Dipole	Frequency [MHz]	TSL	Power [dBm]
D835V2 - SN4d029	835	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	15	CW, 0--		835, 0	9.39	0.99	55.2

Hardware Setup

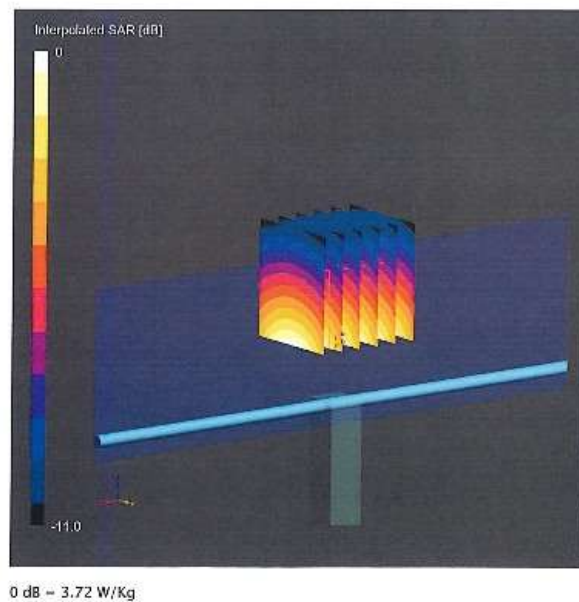
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
MFP V8.0 Center	MSL, 2026-04-24	EX3DV4 - SN7349, 2026-01-29	DAE4ip Sn1836, 2026-02-18

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	2026-04-24
psSAR1g [W/Kg]	2.49
psSAR10g [W/Kg]	1.67
Power Drift [dB]	0.00
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



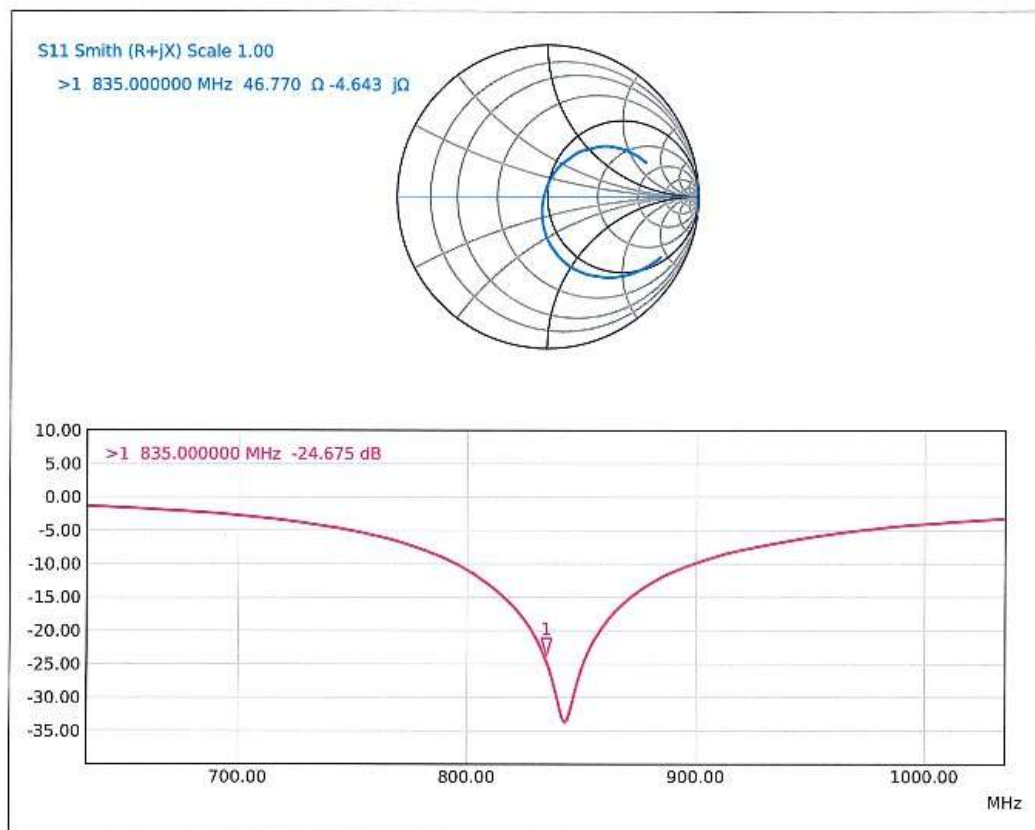
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Impedance Measurement Plot for MSL



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Dipole Data

The table below includes dipole impedance and return loss measurement data measured by Motorola Solutions' EME lab. The results meet the requirements stated in KDB 865664.

Dipole	Head		
CLA150-4010	Impedance		Return Loss
Date Measured	real Ω	imag $j\Omega$	dB
08/16/2024	50.12	-3.90	-22.64
07/14/2025	51.93	-2.67	-21.27
07/14/2026	45.82	-4.76	-19.33

Dipole	Head		
450-1077	Impedance		Return Loss
Date Measured	real Ω	imag $j\Omega$	dB
03/13/2025	56.26	-3.45	-21.16
01/25/2026	54.76	-3.90	-22.20

Dipole	Head		
750-1098	Impedance		Return Loss
Date Measured	real Ω	imag $j\Omega$	dB
11/30/2024	52.71	-3.74	-23.21
11/15/2025	55.28	-4.15	-23.01

Dipole	Head		
750-1142	Impedance		Return Loss
Date Measured	real Ω	imag $j\Omega$	dB
10/2/2025	50.62	-3.68	-25.70

Dipole	Head		
835-4d030	Impedance		Return Loss
Date Measured	real Ω	imag $j\Omega$	dB
06/08/2026	50.45	-1.60	-28.80

Dipole	Head		
835-4d029	Impedance		Return Loss
Date Measured	real Ω	imag $j\Omega$	dB
08/14/2024	47.07	-6.48	-22.84
07/14/2025	47.80	-2.27	-22.71
06/08/2026	49.93	-4.69	-32.00