

D1800V2 - SN: 2d015

April 17, 2025

## System Performance Check Report

## Summary

Device	Frequency (MHz)	TSL	Power (dBm)
D1800V2 - SN2d015	1800	HSL	0.0

## 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	EM, D	1800, 0	1800	0	7.94	1.38	41.3

## Hardware Setup

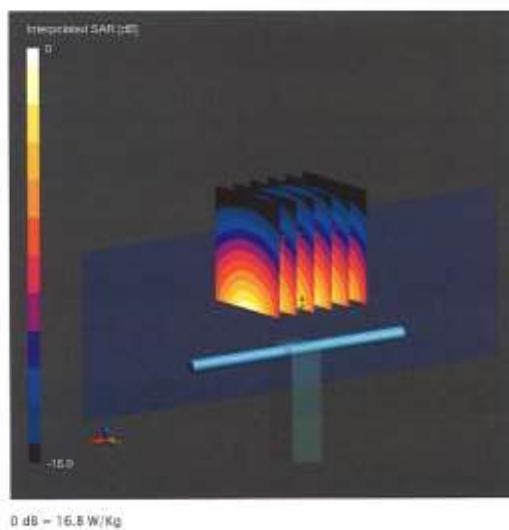
Phantom	TSL, Measured Date	Probe, Calibration Date	BAE, Calibration Date
MPP V8.0 Center	HSL, 2025-04-17	EX3DV4 - SN2d015, 2025-01-18	DAE4185n1882, 2024-11-08

## Scans Setup

	Zoom Scan
Grid Experts (mm)	10 x 10 x 10
Grid Steps (mm)	0.0 x 0.0 x 1.5
Scanner Surface (mm)	1.4
Gridded Grid	Yes
Gridding Ratio	1.5
MoA	N/A
Surface Detection	VM6 + GP
Scan Method	Measured

## Measurement Results

	Zoom Scan
Date	2025-04-17
exSAR1g [W/kg]	9.56
exSAR10g [W/kg]	5.04
Power Drift (dB)	0.00
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative

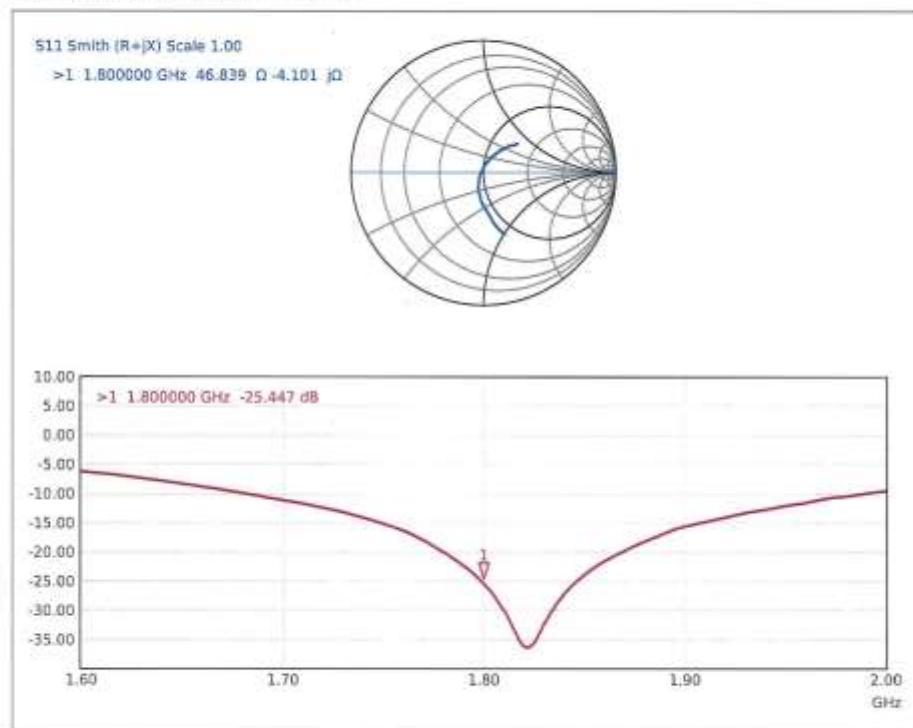


Certificate No: D1800V2-2d015\_Apr25

Page 5 of 8

D1800V2 - SN: 2d015

April 17, 2025

**Impedance Measurement Plot for HSL**

Certificate No: D1800V2-2d015\_Apr25

Page 6 of 6

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Accreditation No.: SCS 0108

Client

HCT

Gyeonggi-do, Republic of Korea

Certificate No.

D1900V2-5d061\_Jan25

**CALIBRATION CERTIFICATE**

Object D1900V2 - SN: 5d061

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

Calibration date January 20, 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	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 [S41B8] Attenuator [S4423]	SN: 1152	28-Mar-24 (No. 217-04050)	Mar-25
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	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

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

Issued: January 21, 2025

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Page 1 of 8

76-1  
PL 76-1  
2025.01.21 2025.02.21

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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%.

D1900V2 - SN: 5d061

January 20, 2025

**Measurement Conditions**

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

DASY Version	DASY8 Module SAR	18.4.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with spacer
Zoom Scan Resolution	dx, dy = 6mm, dz = 1.5mm	Graded Ratio = 1.5 mm (Z direction)
Frequency	1900MHz $\pm$ 1MHz	

**Head TSL parameters at 1900 MHz**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2)°C	39.8 $\pm$ 6%	1.40 mho/m $\pm$ 6%
Head TSL temperature change during test	< 0.5 °C		

**SAR result with Head TSL at 1900 MHz**

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	9.75 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	38.8 W/kg $\pm$ 17.0% (k = 2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	24 dBm input power	5.12 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	20.4 W/kg $\pm$ 16.5% (k = 2)

D1900V2 - SN: 5d061

January 20, 2025

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

Impedance	50.3 $\Omega$ + 5.4 $j\Omega$
Return Loss	-25.4 dB

**General Antenna Parameters and Design**

Electrical Delay (one direction)	1.194 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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D1800V2 - SN: 5d061

January 20, 2025

## System Performance Check Report

## Summary

Dipole	Frequency [MHz]	TSL	Power [dBm]
D1800V2 - SN5d061	1800	HSL	28

## Exposure Conditions

Phantom Section, TSL	Test Distance [mm]	Band	Group, ID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat	10	CE, 0--		1800, 0	7.58	1.40	39.8

## Hardware Setup

Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
MFV 8.0 Center	HSL, 2025-01-20	0810V1 - SN7749, 2025-01-10	DAE10 5a1636, 2024-10-20

## Scans Setup

	Zoom Size
Grid Extent [mm]	30 x 30 x 10
Grid Steps [mm]	6.0 x 6.0 x 1.5
Sensor Surface [mm]	1.4
Grated Grid	Yes
Grating Ratio	1.5
MAP	N/A
Surface Detection	VMS + IQ
Scan Method	Measured

## Measurement Results

	Zoom Size
Date	2025-01-20
psAM1Eq [W/Kg]	0.75
psAM1Eq [m/kg]	5.12
Power Drift [dB]	0.00
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



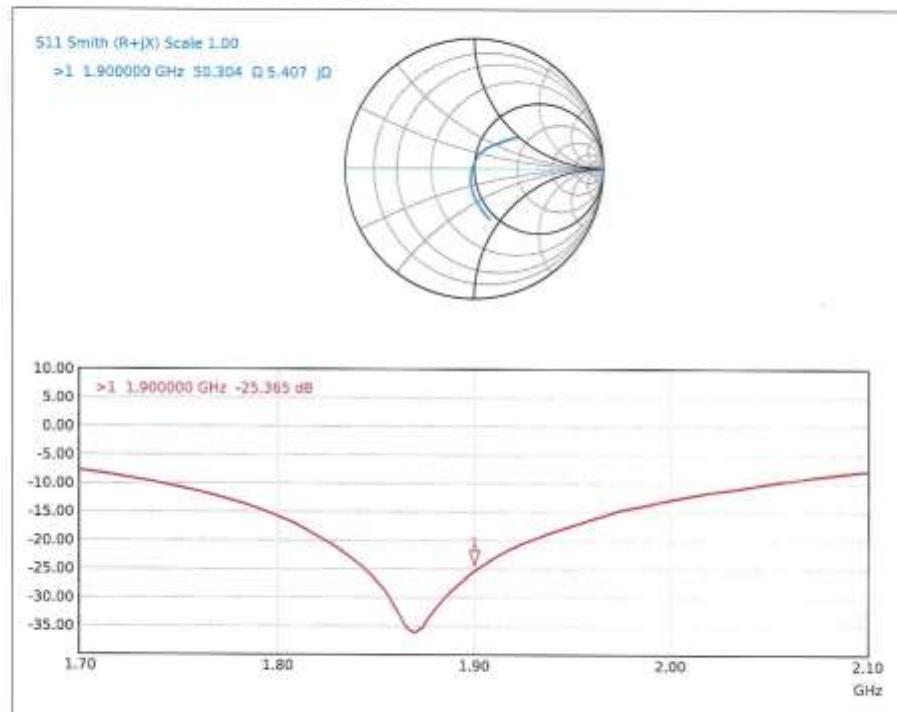
0 dB = 17.5 W/Kg

Certificate No: D1800V2-5d061\_Jan25

Page 5 of 6

D1900V2 - SN: 5d061

January 20, 2025

**Impedance Measurement Plot for Head TSL.**

Certificate No: D1900V2-5d061\_Jan25

Page 6 of 8

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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. **D2600V2-1106\_Apr25**

### CALIBRATION CERTIFICATE

Object **D2600V2 - SN: 1106**

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

Calibration date **April 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  $(22 \pm 3)^\circ\text{C}$  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-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	10-Jan-25 (No. EX3-7349_Jan25)	Jan-26
DAE4ip	SN: 1838	26-Oct-24 (No. DAE4ip-1838_Oct24)	Oct-25

Secondary Standards	ID	Check Date (In house)	Scheduled Check
ACAD Source Box	SN: 1000	28-May-24 (No. 875-ACAD_Source_Box-240528)	May-25
Signal Generator R&S SMB100A	SN: 182081	28-May-24 (No. 875-CAL18-S4588-240528)	May-25
Mismatch; SMA	SN: 1102	22-May-24 (No. 875-Mismatch_SMA-240522)	May-25

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

Issued: April 15, 2025  
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

결	담당자	확인자
재	7.15.25	
제작일	2025.04.15	2025.04.15
일자	7.15.25	2025.04.15

Certificate No: D2600V2-1106\_Apr25

Page 1 of 6

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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 62209-1526, "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 1526: 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%.

D2600V2 - SN: 1106

April 15, 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	$dx, dy = 5\text{mm}, dz = 1.5\text{mm}$	Graded Ratio = 1.5 mm (Z direction)
Frequency	$2600\text{MHz} \pm 1\text{MHz}$	

**HSL parameters at 2600 MHz**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal HSL parameters	22.0 °C	39.0	1.96 mho/m
Measured HSL parameters	(22.0 $\pm 0.2$ )°C	37.3 $\pm 6\%$	2.02 mho/m $\pm 6\%$
HSL temperature change during test	< 0.5 °C		

**SAR result with HSL at 2600 MHz**

SAR averaged over 1 cm <sup>3</sup> (1 g) of HSL	Condition	
SAR for nominal HSL parameters	24 dBm input power	14.0 W/kg
SAR for nominal HSL parameters	normalized to 1W	55.7 W/kg $\pm 17.0\%$ (k = 2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of HSL	Condition	
SAR for nominal HSL parameters	24 dBm input power	6.28 W/kg
SAR for nominal HSL parameters	normalized to 1W	25.0 W/kg $\pm 16.5\%$ (k = 2)

D2600V2 - SN: 1106

April 15, 2025

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

Impedance	48.3 $\Omega$ – 7.4 $\text{j}\Omega$
Return Loss	-22.2 dB

**General Antenna Parameters and Design**

Electrical Delay (one direction)	1.149 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 semi rigid 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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D2600V2 - SN: 1106

April 15, 2025

## System Performance Check Report

## Summary

Dipole	Frequency [MHz]	TSL	Power [dBm]
D2600V2 - SN1106	2600	BSL	24

## Exposure Conditions

Phantom Section, TSL	Test Distance [cm]	Band	Config, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Flat	10	CMW	0	2600, 0	7.2E	1.0E	37.3

## Hardware Setup

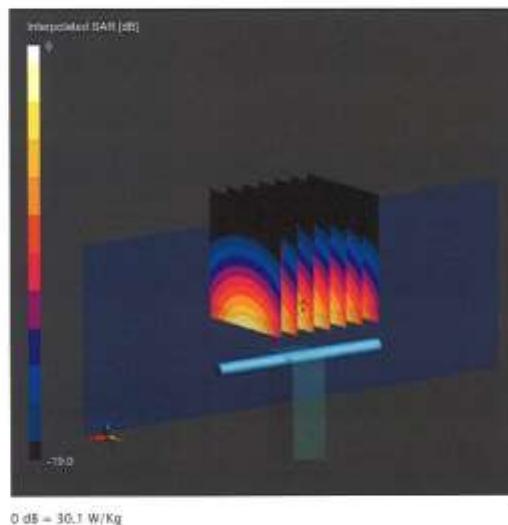
Phantom	TSL, Measured Date	Probe, Calibration Date	IBAF, Calibration Date
MFF vB_S Center	BSL, 2025-04-15	EX3DV6 - SN7348, 2025-01-10	DATA1p3n143E, 2024-10-28

## Scans Setup

	Zoom Scale
Grid Extents [mm]	30 x 30 x 30
Grid Steps [mm]	1.0 x 1.0 x 1.0
Sensor Surface [mm]	1.4
Crated Grid	Yes
Crating Ratio	1.0
MAX	N/A
Surface Detection	All points
Scan Method	Measured

## Measurement Results

	Zoom Scale
Date	2025-04-15
psIA11g [W/Kg]	14.0
psIA11g [W/Kg]	0.28
Power Drift [dB]	0.00
Power Scaling	0.00
Scaling Factor [dB]	0.00
TSL Correction	Positive / Negative

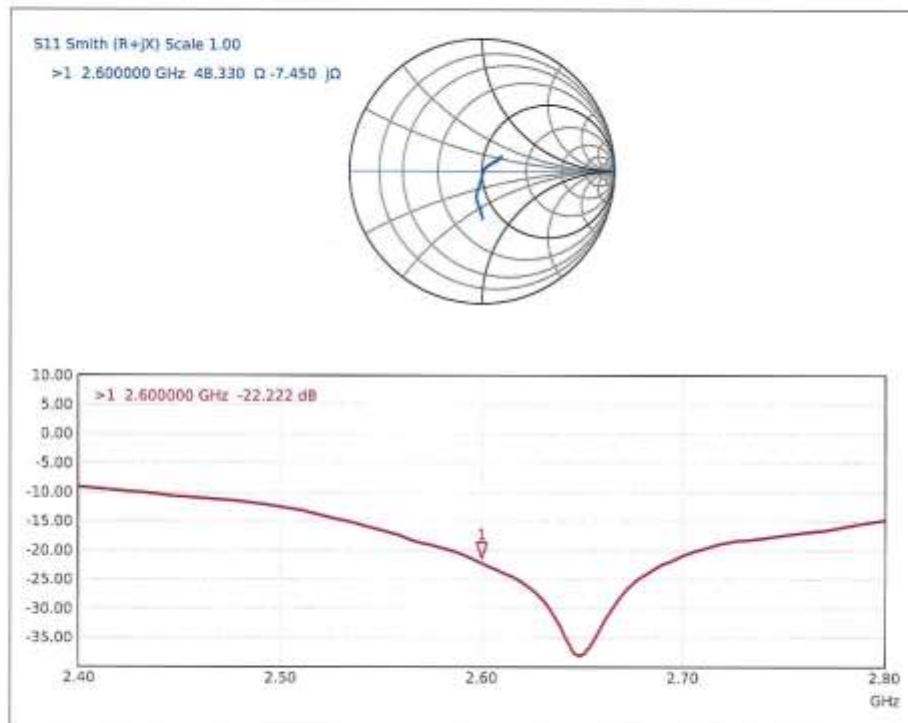


Certificate No: D2600V2-1106\_Apr25

Page 5 of 8

D2600V2 - SN: 1106

April 15, 2025

**Impedance Measurement Plot for HSL**

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Page 6 of 6

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Accreditation No.: SCS 0108

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

Certificate No. **D3500V2-1040\_Jan25**

### CALIBRATION CERTIFICATE

Object **D3500V2 - SN: 1040**

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

Calibration date **January 16, 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	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: 101B	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	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-CAL16-84588-240528)	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 Kuhn	Technical Manager	

Issued: January 16, 2025  
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Page 1 of 6

7/21/24  
PL 3/27 8/1 10/24  
2024.03.27 2025.02.27

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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%.

D3500V2 - SN: 1040

January 16, 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	3500MHz $\pm$ 1MHz	

**Head TSL parameters at 3500 MHz**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	37.9	2.91 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2)°C	37.9 $\pm$ 6%	2.93 mho/m $\pm$ 6%
Head TSL temperature change during test	< 0.5 °C		

**SAR result with Head TSL at 3500 MHz**

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	20 dBm input power	6.52 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	65.2 W/kg $\pm$ 19.9% (k = 2)

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

D3500V2 - SN: 1040

January 16, 2025

**Appendix (Additional assessments outside the scope of SCS 0108)****Antenna Parameters with Head TSL at 3500 MHz**

Impedance	53.9 Ω – 3.2 jΩ
Return Loss	-26.2 dB

**General Antenna Parameters and Design**

Electrical Delay (one direction)	1.14 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 semi-rigid coaxial cable. The center conductor of the leading 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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D3500V2 - SN: 1040

January 16, 2025

## System Performance Check Report

## Summary

Dipole	Frequency [MHz]	TSL	Power [dBm]
D3500V2 - SN1040	5580	HSL	20

## Exposure Conditions

Phantom Section, TSL	Test Distance [mm]	Band	Crop, UID	Frequency [MHz], Channel Number	Conversion Factor	TSL Conductivity [S/m]	TSL Permittivity
Put	10	CE, 0--	1500, 0	8.63	2.93	77.9	

## Hardware Setup

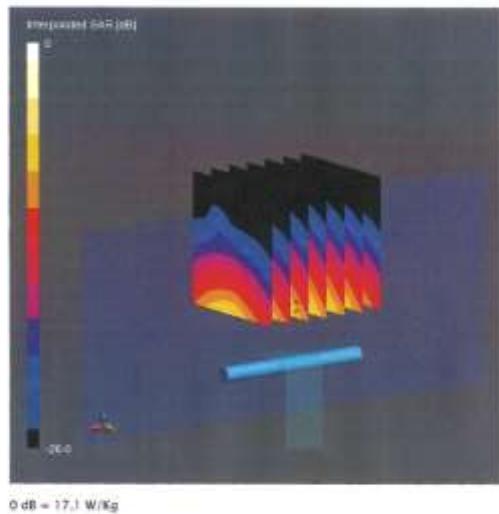
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
MPV V8.0 Center	HSL, 2025-01-16	ER3DW4 - SN7549, 2025-01-10	DAE4ip Sn11836, 2024-10-28

## Scans Setup

	Zoom Scan
Grid Coarseness [mm]	28 x 28 x 28
Grid Steps [mm]	5.0 x 5.0 x 1.4
Sensor Surface [mm]	1.4
Grating Grid	Yes
Grating Ratio	1.3
N/A	N/A
Surface Detector	XMS + Ep
Scan Method	Measured

## Measurement Results

	Zoom Scan
DAE	2025-01-16
μdA/Kg [W/kg]	8.52
μdA/K10g [W/kg]	3.47
Power DAE [dB]	-0.05
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



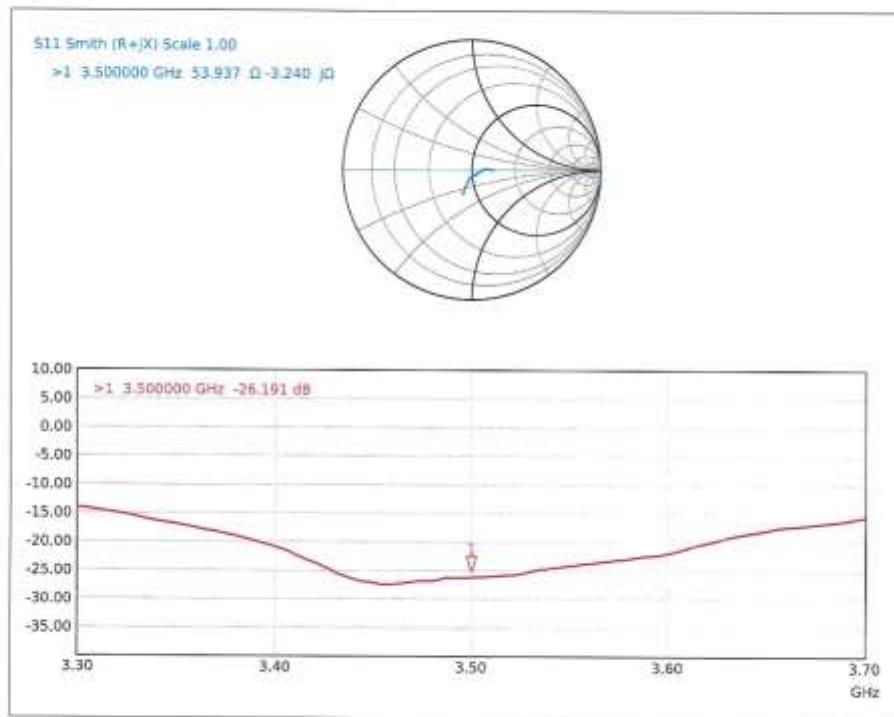
0 dB = 17.1 W/kg

Certificate No: D3500V2-1040\_Jan25

Page 5 of 6

D3500V2 - SN: 1040

January 16, 2025

**Impedance Measurement Plot for Head TSL**

Certificate No: D3500V2-1040\_Jan25

Page 6 of 6

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Accreditation No.: SCS 0108

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

Certificate No. **D3700V2-1105\_Sep24****CALIBRATION CERTIFICATE**

결	날짜	신경증자
제	7/21	9/1
기준/설정	500 / 7/21	7/21
비교	2024/7/16 0:00	2024/7/16 0:00

Object **D3700V2 - SN: 1105**  
Calibration procedure(s) **QA CAL-22.v7**  
Calibration Procedure for SAR Validation Sources between 3 - 10 GHz

Calibration date **September 18, 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 NRP16A	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	26-Mar-24 (No. 217-04050)	Mar-25
OCP DAK-12	SN: 1016	05-Oct-23 (No. OCP-DAK12-1016_Oct23)	Oct-24
OCP DAK-3.5	SN: 1249	05-Oct-23 (No. OCP-DAK3.5-1249_Oct23)	Oct-24
Reference Probe EX3DV4	SN: 7349	03-Jun-24 (No. EX3-7349_Jun24)	Jun-25
DAE4ip	SN: 1836	10-Jan-24 (No. DAE4ip-1836_Jan24)	Jan-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

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

Issued: September 18, 2024  
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%.

D3700V2 - SN: 1105

September 18, 2024

**Measurement Conditions**

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

DASY Version	DASY8 Module SAR	
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	3700MHz ±1MHz	

**Head TSL parameters at 3700 MHz**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	37.7	3.12 mho/m
Measured Head TSL parameters	(22.0 ±0.2)°C	37.4 ±6%	3.07 mho/m ±6%
Head TSL temperature change during test	< 0.5 °C		

**SAR result with Head TSL at 3700 MHz**

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	20 dBm input power	6.93 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	69.3 W/kg ±19.9% (k = 2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	Condition	
SAR for nominal Head TSL parameters	20 dBm input power	2.54 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	25.4 W/kg ±19.5% (k = 2)

D3700V2 - SN: 1105

September 18, 2024

**Appendix (Additional assessments outside the scope of SCS 0108)****Antenna Parameters with Head TSL at 3700 MHz**

Impedance	47.0 $\Omega$ – 1.4 $j\Omega$
Return Loss	-29.3 dB

**General Antenna Parameters and Design**

Electrical Delay (one direction)	1.139 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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D3700V2 - SN: 1105

September 18, 2024

## System Performance Check Report

## Summary

Dipole	Frequency (MHz)	TSL	Power (dBm)
D3700V2 - SN1105	3700	HSL	20

## 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--		3700, 0	6.34	3.07	32.6

## Hardware Setup

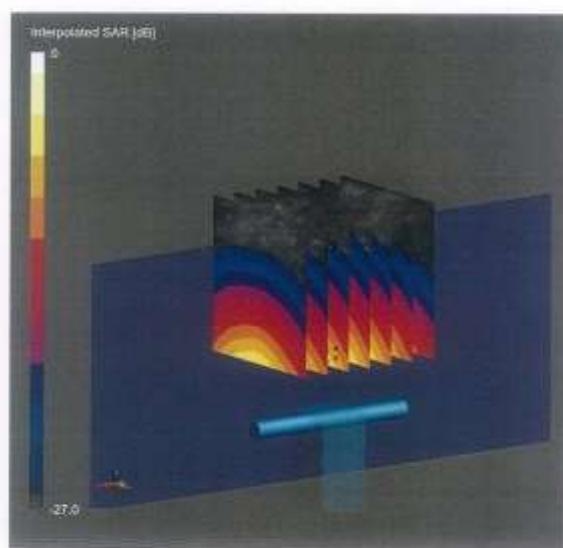
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
MFP V8.0 Center	HSL, 2024-09-18	EX30V4 - SN7349, 2024-06-03	DAE4ip Sn1836, 2024-01-10

## Scans Setup:

	Zoom Scan
Grid Extents [mm]	28 x 28 x 28
Grid Steps [mm]	3.0 x 3.0 x 1.4
Sensor Surface [mm]	1.4
Graded Grid	Yes
Grading Ratio	1.5
MAX	N/A
Surface Detection	VME + Sp
Scan Method	Measured

## Measurement Results

	Zoom Scan
Date	2024-09-18
µSAR5g [W/Kg]	6.93
µSAR10g [W/Kg]	2.54
Power Drift [dB]	-0.01
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



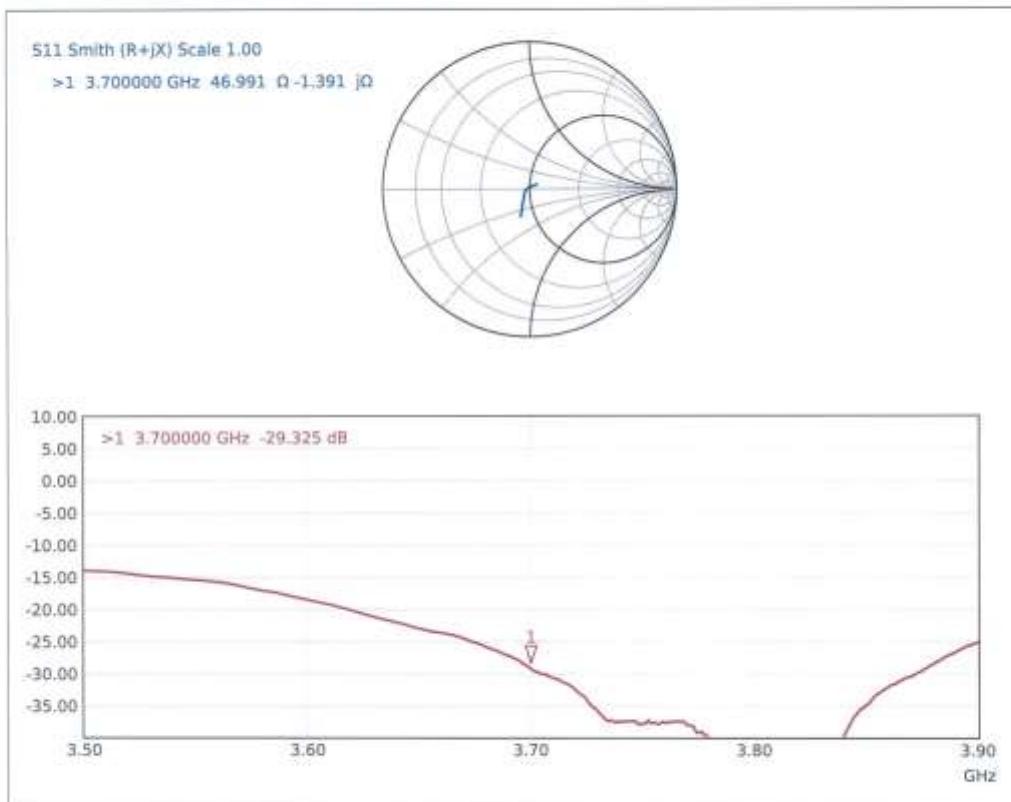
0 dB = 18.7 W/Kg

Certificate No: D3700V2-1105\_Sep24

Page 5 of 6

D3700V2 - SN: 1105

September 18, 2024

**Impedance Measurement Plot for Head TSL**

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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  $(22 \pm 3)^\circ\text{C}$  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	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: May 21, 2025  
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결재	담당자	화인자
서류번호 일자	93 10548 2025 0529	457 8832 2025 0529

Certificate No: D3900V2-1019\_May25

Page 1 of 6

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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%.

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 <sup>3</sup> (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 <sup>3</sup> (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 jΩ
Return Loss	-23.1 dB

**General Antenna Parameters and Design**

Electrical Delay (one direction)	1.103 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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D3900V2 - SN: 1019

May 21, 2025

**System Performance Check Report****Summary**

Dipole	Frequency [MHz]	TSL	Power [dBm]
D3900V2 - SN1019	3900	HSL	20

**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--	033DV4 - SN7349	3900, II	6.17	3.32	38.6

**Hardware Setup**

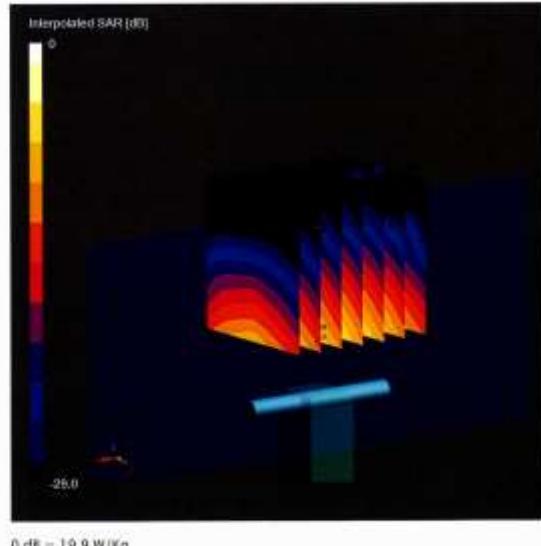
Phantom	TSL, Measured Date	Probe, Calibration Date	DAE, Calibration Date
NPF VILD Center	HSL, 2025-05-21	033DV4 - SN7349, 2025-01-10	DAE41g Sr1836, 2025-04-17

**Scans Setup**

	Zoom Scan
Grid Extents [mm]	28 x 28 x 28
Grid Steps [mm]	5.0 x 5.0 x 1.0
Sensor Surface [mm]	1.0
Graded Grid	Yes
Grading Ratio	1.5
MAX	N/A
Surface Detection	VMS + 6g
Scan Method	Measured

**Measurement Results**

	Zoom Scan
Date	2025-05-21
μSAR1g [W/kg]	7.01
μSAR10g [W/kg]	2.47
Power Drift [dB]	0.00
Power Scaling	Disabled
Scaling Factor [dB]	
TSL Correction	Positive / Negative



Certificate No: D3900V2-1019\_May25

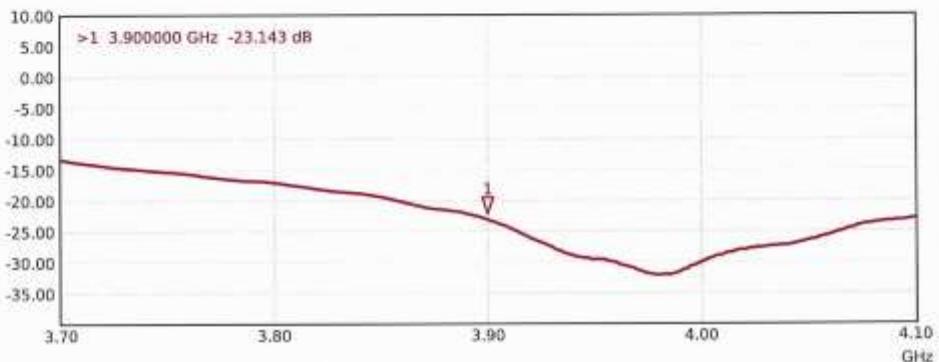
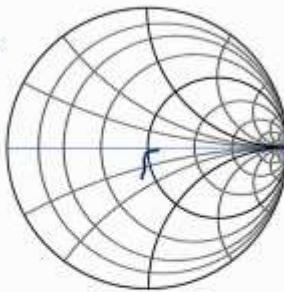
Page 5 of 6

D3900V2 - SN: 1019

May 21, 2025

**Impedance Measurement Plot for HSL**

S11 Smith (R+jX) Scale 1.00  
>1 3.900000 GHz 47.489 Ω -6.323 jΩ



Certificate No: D3900V2-1019\_May25

Page 6 of 6