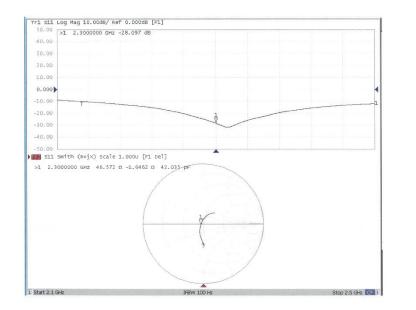






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Impedance Measurement Plot for Head TSL



Certificate No: 24J02Z000517

Page 6 of 6

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Report No. : TESA2411000800EN Page: 32 of 49

Engineering AG Zeughausstrasse 43, 8004 Zurich	y of		 Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service
Accredited by the Swiss Accreditation Service The Swiss Accreditation Service Multilateral Agreement for the re	is one of the signatorie		Accreditation No.: SCS 0108
Client SGS Taoyuan City		Certificate No	D2600V2-1005_Jan24
CALIBRATION C	ERTIFICATI	Ξ	
Dbject	D2600V2 - SN:10	005	
Calibration procedure(s)	QA CAL-05.v12 Calibration Proce	edure for SAR Validation Source	s between 0.7-3 GHz
Calibration date:	January 22, 2024	4	
		robability are given on the following pages a ry facility: environment temperature $(22 \pm 3)^{\circ}$	
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Certificate No: D2600V2-1005 Jan24

Page 1 of 6

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Report No. : TESA2411000800EN Page: 33 of 49

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



Schweizerischer Kalibrierdienst Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service

Accreditation No.: SCS 0108

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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

Glossary: TSL

ConvF N/A

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

Calibration is Performed According to the Following Standards:

- a) 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.
- b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

c) 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%.

Certificate No: D2600V2-1005_Jan24

Page 2 of 6

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Report No. : TESA2411000800EN Page: 34 of 49

Measurement Conditions

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

DASY Version	DASY52	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.9 ± 6 %	2.02 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	250 mW input power	14.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	56.0 W/kg ± 17.0 % (k=2)
SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR averaged over 10 cm ³ (10 g) of Head TSL SAR measured	condition 250 mW input power	6.36 W/kg

Certificate No: D2600V2-1005_Jan24

Page 3 of 6

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Report No. : TESA2411000800EN Page: 35 of 49

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.8 Ω - 3.4 jΩ	
Return Loss	- 28.8 dB	

General Antenna Parameters and Design

Electrical Delay (one direction)	1.153 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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Certificate No: D2600V2-1005_Jan24

Page 4 of 6

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Report No. : TESA2411000800EN Page: 36 of 49

Date: 22.01.2024

DASY5 Validation Report for Head TSL

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1005

Communication System: UID 0 - CW; Frequency: 2600 MHz Medium parameters used: f = 2600 MHz; σ = 2.02 S/m; ϵ_r = 37.9; ρ = 1000 kg/m³ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN7349; ConvF(7.84, 7.84, 7.84) @ 2600 MHz; Calibrated: 03.11.2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 03.10.2023 •
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001 .
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 116.7 V/m; Power Drift = 0.01 dB Peak SAR (extrapolated) = 28.4 W/kg SAR(1 g) = 14.3 W/kg; SAR(10 g) = 6.36 W/kgSmallest distance from peaks to all points 3 dB below = 8.9 mmRatio of SAR at M2 to SAR at M1 = 50.1%Maximum value of SAR (measured) = 23.4 W/kg



0 dB = 23.4 W/kg = 13.68 dBW/kg

Certificate No: D2600V2-1005_Jan24

Page 5 of 6

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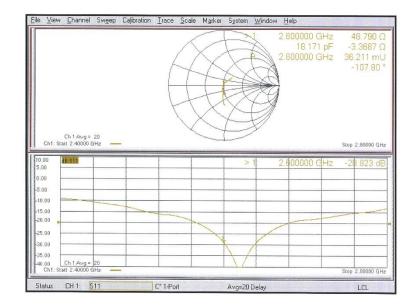
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Report No. : TESA2411000800EN Page: 37 of 49

Impedance Measurement Plot for Head TSL



Certificate No: D2600V2-1005_Jan24

Page 6 of 6

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	Client SGS	intp://www.co		J02Z000520
	CALIBRATION C	ERTIFICAT	ΓE	
	Object	D3500	IV2 - SN: 1017	
	Calibration Procedure(s)		1-003-01 ation Procedures for dipole validation kits	
	Calibration date:	Augus	t 22, 2024	
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Page 1 of 6

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Glossary:

TSL ConvF N/A

tissue simulating liquid sensitivity in TSL / NORMx,y,z not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) 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-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and
- Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020 b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

c) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point. No uncertainty required. SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

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

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Page 2 of 6

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Measurement Conditions

DASY Version	DASY52	52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	3500 MHz ± 1 MHz	

Head TSL parameters

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	37.9	2.91 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.2 ± 6 %	2.94 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C		

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.68 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	66.7 W/kg ± 24.4 % (k=2)
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.60 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	26.0 W/kg ± 24.2 % (k=2)

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Page 3 of 6

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	56.5Ω- 2.81jΩ	
Return Loss	- 23.5dB	

General Antenna Parameters and Design

Electrical Delay (one direction)	1.037 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly In a upper is made of standard seminglic daxta 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 feed-point may be damaged.

Additional EUT Data

SPEAG

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Page 4 of 6

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DASY5 Validation Report for Head TSL

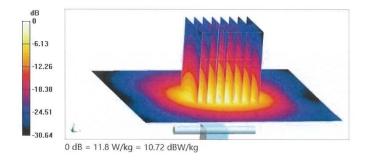
Date: 2024-08-22

Test Laboratory: CTTL, Beijing, China DUT: Dipole 3500 MHz; Type: D3500V2; Serial: D3500V2 - SN: 1017 Communication System: UID 0, CW; Frequency: 3500 MHz Medium parameters used: f = 3500 MHz; σ = 2.942 S/m; ϵ_r = 38.17; ρ = 1000 kg/m^3 Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

- DASY5 Configuration:
 - Probe: EX3DV4 SN7464; ConvF(6.73, 6.82, 6.94) @ 3500 MHz; Calibrated: 2024-01-22
 - Sensor-Surface: 1.4mm (Mechanical Surface Detection)
 - Electronics: DAE4 Sn1556; Calibrated: 2024-01-03
 - Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: . 1062
 - DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration /Pin=100mW, d=10mm, f=3500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 67.21 V/m; Power Drift = -0.06 dB Peak SAR (extrapolated) = 16.5 W/kg SAR(1 g) = 6.68 W/kg; SAR(10 g) = 2.6 W/kg Smallest distance from peaks to all points 3 dB below = 8 mm Ratio of SAR at M2 to SAR at M1 = 77.4% Maximum value of SAR (measured) = 11.8 W/kg



Certificate No: 24J02Z000520

Page 5 of 6

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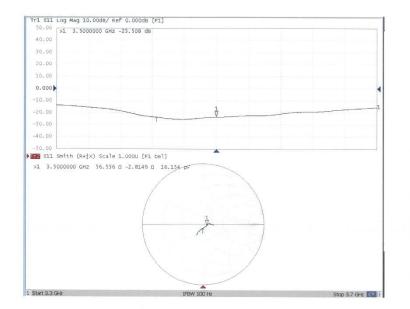






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Impedance Measurement Plot for Head TSL



Certificate No: 24J02Z000520

Page 6 of 6

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	Client SGS	ERTIFICAT		
	Object	D3700	V2 - SN: 1057	
	Calibration Procedure(s)		-003-01 tion Procedures for dipole validation kits	
	Calibration date:	Novem	ber 21, 2024	New York Control of Co
humidity<70%.				
			the closed laboratory facility: environment t	emperature (22±3)°C and
	humidity<70%. Calibration Equipment used	I (M&TE critical f	or calibration)	
	humidity<70%.			emperature (22±3)°C and Scheduled Calibration May-25
	humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A	I (M&TE critical f	or calibration) Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
	humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4	I (M&TE critical f ID # 106276 101369 SN 7517	Cal Date (Calibrated by, Certificate No.) 17-May-24 (CTTL, No. J24X04107) 17-May-24 (CTTL, No. J24X04107) 21-Feb-24(CTTL-SPEAG, No. 24J02Z80008)	Scheduled Calibration May-25 May-25 Feb-25
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	humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C	I (M&TE critical f 106276 101369 SN 7517 SN 1588 ID # MY49071430	Cal Date (Calibrated by, Certificate No.) 17-May-24 (CTTL, No. J24X04107) 17-May-24 (CTTL, No. J24X04107) 21-Feb-24 (CTTL-SPEAG, No. 24J02Z80008) 13-Sep-24(CTTL-SPEAG, No. 24J02Z000713) Cal Date (Calibrated by, Certificate No.) 25-Dec-23 (CTTL, No. J23X13426)	Scheduled Calibration May-25 May-25 Feb-25 Sep-25 Scheduled Calibration Dec-24
	humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C	I (M&TE critical f 106276 101369 SN 7517 SN 1588 ID # MY49071430 MY46110673	Cal Date (Calibrated by, Certificate No.) 17-May-24 (CTTL, No. J24X04107) 17-May-24 (CTTL, No. J24X04107) 21-Feb-24 (CTTL-SPEAG, No. 24J02Z80008) 13-Sep-24 (CTTL-SPEAG, No. 24J02Z800713) Cal Date (Calibrated by, Certificate No.) 25-Dec-23 (CTTL, No. J23X13426) 25-Dec-23 (CTTL, No. J23X13425)	Scheduled Calibration May-25 May-25 Feb-25 Sep-25 Scheduled Calibration Dec-24 Dec-24
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	humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C	I (M&TE critical f 106276 101369 SN 7517 SN 1588 ID # MY49071430 MY46110673 1040	Cal Date (Calibrated by, Certificate No.) 17-May-24 (CTTL, No. J24X04107) 17-May-24 (CTTL, No. J24X04107) 21-Feb-24 (CTTL-SPEAG, No. 24J02Z80008) 13-Sep-24 (CTTL-SPEAG, No. 24J02Z800713) Cal Date (Calibrated by, Certificate No.) 25-Dec-23 (CTTL, No. J23X13426) 25-Dec-23 (CTTL, No. J23X13425) 22-Jan-24 (SPEAG, No.OCP-DAK3.5-1040_Jan24)	Scheduled Calibration May-25 May-25 Feb-25 Sep-25 Scheduled Calibration Dec-24 Dec-24 Jan-25
	humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP6A Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C OCP DAK-3.5(weighted)	I (M&TE critical f 106276 101369 SN 7517 SN 1588 ID # MY49071430 MY46110673 1040 Name	Cal Date (Calibrated by, Certificate No.) 17-May-24 (CTTL, No. J24X04107) 17-May-24 (CTTL, No. J24X04107) 21-Feb-24 (CTTL-SPEAG, No. 24J02280008) 13-Sep-24 (CTTL-SPEAG, No. 24J022000713) Cal Date (Calibrated by, Certificate No.) 25-Dec-23 (CTTL, No. J23X13426) 25-Dec-23 (CTTL, No. J23X13425) 22-Jan-24(SPEAG, No. OCP-DAK3.5-1040_Jan24) Function	Scheduled Calibration May-25 May-25 Feb-25 Sep-25 Scheduled Calibration Dec-24 Dec-24 Jan-25

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Page 1 of 6

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Glossary:

TSL ConvF N/A

tissue simulating liquid sensitivity in TSL / NORMx,y,z not applicable or not measured

Calibration is Performed According to the Following Standards:

a) 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-mounted

- Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020
- b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

c) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions: Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL: The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss: These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay: One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured: SAR measured at the stated antenna input power.
- SAR normalized: SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

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

Certificate No: 24J02Z000932

Page 2 of 6

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Measurement Conditions

DASY Version	DASY52	52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	3700 MHz ± 1 MHz	

Head TSL parameters at 3700 MHz

	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	36.9 ± 6 %	3.03 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C		

المعالمة

SAR result with Head TSL at 3700 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	6.74 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	67.5 W/kg ± 24.4 % (k=2)
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	100 mW input power	2.46 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.5 W/kg ± 24.2 % (k=2)

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Page 3 of 6

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL at 3700 MHz

Impedance, transformed to feed point	51.5Ω+ 3.52jΩ	
Return Loss	- 28.5dB	

General Antenna Parameters and Design

Electrical Delay (one direction)	1.042 ns	

After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point 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 feed-point may be damaged. connections near the feed-point may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

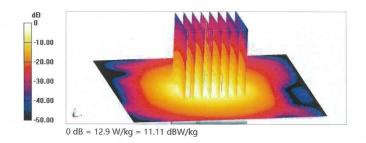
Date: 2024-11-21

Test Laboratory: CTTL, Beijing, China DUT: Dipole 3700 MHz; Type: D3700V2; Serial: D3700V2 - SN: 1057 Communication System: UID 0, CW; Frequency: 3700 MHz; Medium parameters used: f = 3700 MHz; σ = 3.032 S/m; ϵ r = 36.89; ρ = 1000 kg/m³ Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007) **DASY5** Configuration:

- Probe: EX3DV4 SN7517; ConvF(6.56, 6.56, 6.56) @ 3700 MHz; Calibrated: 2024-02-21
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1588; Calibrated: 2024-09-13
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: .
- 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

Dipole Calibration /Pin=100mW, d=10mm, f=3700 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 69.51 V/m; Power Drift = -0.05 dB Peak SAR (extrapolated) = 18.1 W/kg SAR(1 g) = 6.74 W/kg; SAR(10 g) = 2.46 W/kg Smallest distance from peaks to all points 3 dB below = 8 mm Ratio of SAR at M2 to SAR at M1 = 75.4% Maximum value of SAR (measured) = 12.9 W/kg



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Page 5 of 6

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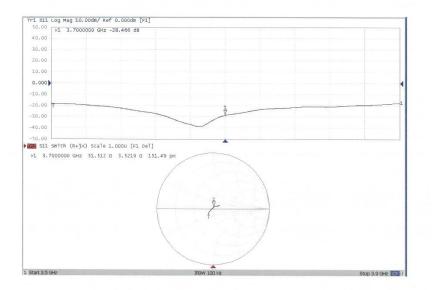






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Impedance Measurement Plot for Head TSL



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Page 6 of 6

- End of report -

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