

Report No. : TESA2310000634ES Page: 1 of 26

Appendix C

System Validation from Original Equipment Supplier

Engineering AG eughausstrasse 43, 8004 Zurich,	Switzerland	C S	Service suisse d'étalonnage Servizio svizzero di taratura Swiss Calibration Service
ccredited by the Swiss Accreditation the Swiss Accreditation Service is ultilateral Agreement for the reco	s one of the signatorie	s to the EA	ccreditation No.: SCS 0108
lient SGS Taoyuan City			^{2.} 5G-Veri10-1070_Aug23
CALIBRATION C	ERTIFICAT	E	
Object	5G Verification S	Source 10 GHz - SN: 1070	
Calibration procedure(s)	QA CAL-45.v4 Calibration proce	edure for sources in air above 6 G	ĞHz
Calibration date:	August 08, 2023	R.	
		tional standards, which realize the physical un probability are given on the following pages ar	
The measurements and the uncerta All calibrations have been conducte Calibration Equipment used (M&TE Primary Standards	ainties with confidence p ad in the closed laborate	probability are given on the following pages ar ory facility: environment temperature (22 ± 3)°(Cal Date (Certificate No.)	nd are part of the certificate. C and humidity < 70%. Scheduled Calibration
The measurements and the uncerta All calibrations have been conducte Calibration Equipment used (M&TE Primary Standards Reference Probe EUmmWV3	ainties with confidence p ad in the closed laborato critical for calibration)	probability are given on the following pages are by facility: environment temperature $(22\pm3)^{\circ}$	nd are part of the certificate. C and humidity < 70%.
The measurements and the uncerta	ainties with confidence p and in the closed laborato critical for calibration) ID # SN: 9374	probability are given on the following pages are bry facility: environment temperature (22 ± 3)*4 Cal Date (Certificate No.) 22-May-23 (No. EUmm-9374_May23)	nd are part of the centificate. C and humidity < 70%. Scheduled Calibration May-24
The measurements and the uncerturn All calibrations have been conducte Calibration Equipment used (M&TE Primary Standards Reference Probe EUmmWV3 DAE4ip	ainties with confidence p ed in the closed laborato in the closed laborato critical for calibration) iD # SN: 9374 SN: 1602 iD # SN: 100184 SN: 101258	probability are given on the following pages are bry facility: environment temperature (22 ± 3)*4 Cal Date (Certificate No.) 22-May-23 (No. EUmm-9374_May23) 05-Jul-23 (No. DAE4ip-1602_Jul23)	nd are part of the centificate. C and humidity < 70%. Scheduled Calibration May-24 Jul-24
The measurements and the uncert All calibrations have been conducte Calibration Equipment used (MATE Primary Standards Reference Probe EUmmWV3 DAE4ip Secondary Standards RF generator R&S SMF100A Power sensor R&S NRP108-10 Network Analyzer Keysight E50634	Intrie with confidence p id in the closed laboratic critical for calibration) ID # ID # ID # SN: 100184 SN: 101258 SN: MY54504221	probability are given on the following pages are bry facility: environment temperature (22 ± 3)% Cai Date (Certificate No.) 22-May-23 (No. EUmm-9374_May23) 05-Juli-23 (No. EUmm-9374_May23) 05-Juli-2	nd are part of the centificate. C and humidity < 70%. Scheduled Calibration May-24 Jul-24 Scheduled Check In house check: Nov-23 In house check: Nov-23
The measurements and the uncert All calibrations have been conducte Calibration Equipment used (MATE Primary Standards Reference Probe EUmmWV3 DAE4ip Secondary Standards Ref generator R&S SMF100A Power sensor R&S NRP108-10 Network Analyzer Keysight E50634	ainties with confidence p ed in the closed laborato critical for calibration) ID # SN: 9374 SN: 1602 ID # SN: 100184 SN: 101258 SN: 101258 SN: MY54504221	probability are given on the following pages are only facility: environment temperature (22 ± 3)*4 Cal Date (Certificate No.) 22-May-23 (No. EUmm-9374_May23) 05-Jul-23 (No. EUmm-9374_May23)	nd are part of the certificate. C and humidity < 70%. Scheduled Calibration May-24 Jul-24 Scheduled Check In house check: Nov-23 In house check: Nov-23 In house check: Oct-25
The measurements and the uncert All calibrations have been conducts Calibration Equipment used (M&TE Primary Standards Reference Probe EUmmWV3 DAE4ip Secondary Standards RF generator R&S SMF100A Power sensor R&S NRF108-10	Intrie with confidence p id in the closed laboratic critical for calibration) ID # ID # ID # SN: 100184 SN: 101258 SN: MY54504221	probability are given on the following pages are bry facility: environment temperature (22 ± 3)% Cai Date (Certificate No.) 22-May-23 (No. EUmm-9374_May23) 05-Juli-23 (No. EUmm-9374_May23) 05-Juli-2	nd are part of the certificate. C and humidity < 70%. Scheduled Calibration May-24 Jul-24 Scheduled Check In house check: Nov-23 In house check: Nov-23 In house check: Oct-25

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



erischer 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

Glossarv

CW

Continuous wave

Calibration is Performed According to the Following Standards

- Internal procedure QA CAL-45, Calibration procedure for sources in air above 6 GHz.
- IEC/IEEE 63195-1, "Assessment of power density of human exposure to radio frequency fields from wireless devices in close proximity to the head and body (frequency range of 6 GHz to 300 GHz)", May 2022

Methods Applied and Interpretation of Parameters

- $\label{eq:coordinate} Coordinate System: z-axis in the waveguide horn boresight, x-axis is in the direction of the E-field, y-axis normal to the others in the field scanning plane parallel to the horn flare and$ horn flange.
- Measurement Conditions: (1) 10 GHz: The radiated power is the forward power to the horn antenna minus ohmic and mismatch loss. The forward power is measured prior and after the measurement with a power sensor. During the measurements, the horn is directly connected to the cable and the antenna ohmic and mismatch losses are determined by farfield measurements. (2) 30, 45, 60 and 90 GHz: The verification sources are switched on for at least 30 minutes. Absorbers are used around the probe cub and at the ceiling to minimize reflections
- Horn Positioning: The waveguide horn is mounted vertically on the flange of the waveguide source to allow vertical positioning of the EUmmW probe during the scan. The plane is parallel to the phantom surface. Probe distance is verified using mechanical gauges positioned on the flare of the horn.
- E- field distribution: E field is measured in two x-y-plane (10mm, 10mm + N/4) with a vectorial E-field probe. The E-field value stated as calibration value represents the E-fieldmaxima and the averaged (1cm² and 4cm²) power density values at 10mm in front of the
- Field polarization: Above the open horn, linear polarization of the field is expected. This is verified graphically in the field representation.

Calibrated Quantity

Local peak E-field (V/m) and average of peak spatial components of the poynting vector (W/m^2) averaged over the surface area of 1 cm² and 4cm² at the nominal operational frequency of the verification source. Both square and circular averaging results are listed.

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

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Measurement Conditions

DASY Version	DASY8 Module mmWave	V3.2
Phantom	5G Phantom	
Distance Horn Aperture - plane	10 mm	
Number of measured planes	2 (10mm, 10mm + N4)	
Frequency	10 GHz ± 10 MHz	

Calibration Parameters, 10 GHz

Circular Averaging

Distance Horn Aperture to Measured Plane	Prad' (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Avg Power Density Avg (psPDn+, psPDtot+, psPDmod+) (W/m ²)		Uncertainty (k = 2)
	1	1		1 cm ²	4 cm ²	1.000
10 mm	93.3	151	1.27 dB	60.3	56.1	1.28 dB
Distance Horn Aperture to Measured Plane	Prad¹ (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Power Density psPDn+, psPDtot+, psPDmod+ (W/m²)		Uncertainty (k = 2)
				1 cm ²	4 cm ²	
10 mm	93.3	151	1.27 dB	59.5, 60.4, 60.9	55.2, 56.4, 56.8	1.28 dB

Square Averaging

Distance Horn Aperture to Measured Plane	Prad ¹ (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Avg Power Density Avg (psPDn+, psPDtat+, psPDmod+) (W/m ²)		Uncertainty (k = 2)
	1			1 cm ²	4 cm ²	
10 mm	93.3	151	1.27 dB	60.3	56.1	1.28 dB
Distance Horn Aperture to Measured Plane	Prad ¹ (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Power Density psPDn+, psPDtot+, psPDmod+ (W/m ²)		Uncertainty (k = 2)
				1 cm ²	4 cm ²	
10 mm	93.3	151	1.27 dB	59.6, 60.4, 61.0	55.1, 56.3, 56.8	1.28 dB

Max Power Density

Distance Horn Aperture to Measured Plane	Prad ¹ (mW)	Max E-field (V/m)	Uncertainty (k = 2)	Max Power Density Sn. Stot, Stot (W/m ²)	Uncertainty (k = 2)
10 mm	93.3	151	1.27 dB	61.3, 62.0, 62.5	1.28 dB

¹ Assessed ohmic and mismatch loss plus numerical offset: 0.30 dB

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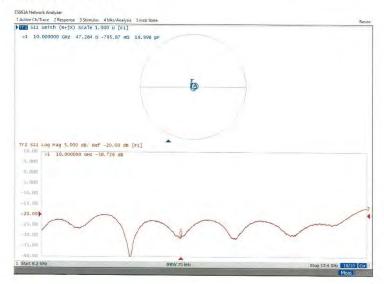
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Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters

Impedance, transformed to feed point	47.3 Ω - 0.8 jΩ	
Return Loss	- 30.7 dB	

Impedance Measurement Plot



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DASY Report

Measurement Report for 5G Verification Source 10 GHz, UID 0 -, Channel 10000 (10000.0MHz)

G Verification Source 10 GHz	Dimensions [mm 100.0 x 100.0 x 1		IMEI SN: 107	D	DUT Type	
xposure Conditions						
hantom Section	Position, Test Distance [mm]	Band	Grou	p,	Frequency [MHz] Channel Number	
G - 1	10.0 mm	Validation band	CW		10000.0, 10000	1.0
lardware Setup						
'hantom nmWave Phantom - 1002	Medium Air			Probe, Calibration D EUmmWV3 - SN9374 2023-05-22		DAE, Calibration Date DAE4ip Sn1602, 2023-07-05
can Setup				Measurement R	esults	
Common Conferent Incom)			Scan			5G Scan
Sensor Surface [mm] MAIA		MAIA not u	10.0 Ised	Date Avg. Area [cm ²]		2023-08-08, 12:20 1.00
				Avg. Type		Circular Averaging
				psPDn+ [W/m ²]		59.5
				psPDtot+ [W/m ²]		60.4
				psPDmod+ [W/m ²] Max(Sn) [W/m ²]		60.9 61.3
				Max(Stot) [W/m ²]		62.0
				Max(Stot)[W/m	1	62.5
				E _{max} [V/m]		151
				Power Drift [dB]		0.08
	sPDiote (3.1	km2, sire) (W/m/2)				

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DASY Report

Measurement Report for 56 Verification Source 10 GHz LUD 0 - Chappel 10000 (10000 0MHz)

Device under Test Pro Name, Manufacturer	Dimensions [mm	i.	IMEI		DUT Type	
5G Verification Source 10 G			SN: 10	0		
Exposure Conditions	a second to the second		24.0		Suma Calence	
Phantom Section	Position, Test Distance [mm]	Band	Gro	,qt	Frequency [MHz], Channel Number	Conversion Factor
5G -	10.0 mm	Validation band	i cw		10000.0, 10000	1.0
Hardware Setup						
Phantom	Medium			Probe, Calibration D	ate	DAE, Calibration Date
mmWave Phantom - 1002	Air			EUmmWV3 - SN937- 2023-05-22		DAE4ip Sn1602, 2023-07-05
Scan Setup				Measurement R	tesults	
Sensor Surface [mm]		5G	Scan 10.0	Date		5G Scar
MAIA		MAIA not		Avg. Area [cm ²]		2023-08-08, 12:20 4.00
		111101	- unite	Avg. Type		Circular Averaging
				psPDn+ [W/m ²]		55.2
				psPDtot+ [W/m ²]		56.4
				psPDmod+ [W/m ²] Max(Sn) [W/m ²]		56.8
				Max(Stot) [W/m ²]		61.3
				Max(Stot) [W/m	2]	62.5
				Emax [V/m]		15:
				Power Drift [dB]		0.08
	sPDtot+ (4.0	0cm2, circ) [W/m^2]				
		-		-		
			150			
			11/2	THE REAL PROPERTY		
				- A		
			ALC: N			

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DASY Report

Measurement Report for 5G Verification Source 10 GHz, UID 0 -, Channel 10000 (10000.0MHz)

Name, Manufacturer 5G Verification Source 10 Gl	Dimensions [mn Hz 100.0 x 100.0 x 1		IMEI SN: 1070	0	DUT Type	
xposure Conditions hantom Section	Position, Test Distance [mm]	Band	Grou	p,	Frequency [MHz], Channel Number	Conversion Factor
G -	10.0 mm	Validation band	CW		10000.0, 10000	1.0
lardware Setup hantom						
nantom imWave Phantom - 1002	Medium Air			Probe, Calibration Da EUmmWV3 - SN9374 2023-05-22		DAE, Calibration Date DAE4ip Sn1602, 2023-07-05
can Setup				Measurement Re	sults	
			Scan			5G Scan
Sensor Surface [mm] MAIA		MAIA not u	10.0	Date Avg. Area [cm ²]		2023-08-08, 12:20
		IVIAIA NOT U	u560	Avg. Area [cm*] Avg. Type		1.00 Square Averaging
				psPDn+ [W/m ²]		59.6
				psPDtot+ [W/m ²]		60.4
				psPDmod+ [W/m ²]		61.0
				Max(Sn) [W/m ²] Max(Stot) [W/m ²]		61.3 62.0
				Max(Stot) [W/m ²		62.5
				Emax [V/m]		151
				Power Drift [dB]		0.08
	sPDtot+ {1.6	3cm2, sq) [W/m^2]				

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DASY Report

Measurement Report for 5G Verification Source 10 GHz, UID 0 -, Channel 10000 (10000.0MHz)

Device under Test Properties

Dimensions [mm	1	IMEI	DUT Type	
3Hz 100.0 x 100.0 x 1	172.0	SN: 1070		
Position, Test Distance	Band	Group,	Frequency [MHz],	Conversion Factor
[mm]			Channel Number	
	SHz 100.0 x 10	Dimensions [mm] GHz 100.0 x 100.0 x 172.0 Position, Test Distance Band	Dimensions [mm] IMEI GHz 100.0 x 100.0 x 172.0 SN: 1070 Position, Test Distance Band Group,	Dimensions [mm] IMEI DUT Type GHz 100.0 x 100.0 x 172.0 SN: 1070 - Position, Test Distance Band Group, Frequency [MHz],

	[mm]			Channel N
5G -	10.0 mm	Validation band	CW	10000.0,
				10000

Hardware Setup

Phantom mmWave Phantom - 1002 Medium Probe, Calibration Date EUmmWV3 - SN9374_F1-55GHz, 2023-05-22

Measurement Results

DAE, Calibration Date DAE4ip Sn1602, 2023-07-05

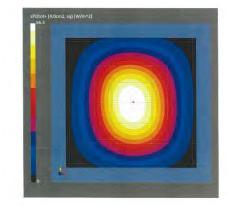
1.0

Scan Setup
Sensor Surface [mm]
MAIA

5G Scan Date 10.0 MAIA not used

Date
Avg. Area [cm ²]
Avg. Type
psPDn+ [W/m ²]
psPDtot+ [W/m2]
psPDmod+ [W/m2]
Max(Sn) [W/m ²]
Max(Stot) [W/m ²]
Max(Stot) [W/m ²]
Emax [V/m]
Power Drift [dB]

5G Scan
2023-08-08, 12:20
4.00
Square Averaging
55.1
56.3
56.8
61.3
62.0
62.5
151
0.08



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	Add: No.52 HuaYuanBei Ro. Tel: +86-10-62304633-2117 E-mail: emf@caictac.m Client SGS	e a g	t.ac.cn	中国认可 国际互认 校准 CALIBRATION CNAS L0570
	CALIBRATION CE	RTIFICAT	Е	
	Object	D1750\	/2 - SN: 1158	
	Calibration Procedure(s)	FF-Z11	-003-01 tion Procedures for dipole validation kits	
	Calibration date:	August	25, 2023	
	All calibrations have been humidity<70%. Calibration Equipment used		he closed laboratory facility: environment	nt temperature (22±3)℃ and
	Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)) Scheduled Calibration
	Power Meter NRP2	106277	22-Sep-22 (CTTL, No.J22X09561)	Sep-23
	Power sensor NRP8S	104291	22-Sep-22 (CTTL, No.J22X09561)	Sep-23
	Reference Probe EX3DV4	SN 3617	31-Mar-23(CTTL-SPEAG,No.Z23-60161	
	DAE4	SN 1556	11-Jan-23(CTTL-SPEAG,No.Z23-60034) Jan-24
	Secondary Standards	ID#	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
	Signal Generator E4438C	MY49071430		Jan-24
	Network Analyzer E5071C	MY46110673	10-Jan-23 (CTTL, No. J23X00104)	Jan-24
		Name	Function	Signature
	Calibrated by:	Zhao Jing	SAR Test Engineer	教
	Reviewed by:	Lin Hao	SAR Test Engineer	tital
	Approved by:	Qi Dianyuan	SAR Project Leader	aver

Certificate No: J23Z60370

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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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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, dz = 5 mm	

Head TSL parameters

Frequency

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.0 ± 6 %	1.35 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C		

1750 MHz ± 1 MHz

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.07 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	36.8 W/kg ± 18.8 % (k=2)
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	1
SAR measured	250 mW input power	4.81 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.4 W/kg ± 18.7 % (k=2)

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	47.5Ω- 1.44jΩ
Return Loss	- 30.7dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.125 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.

Additional EUT Data

Manufactured by	SPEAG

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DASY5 Validation Report for Head TSL

Date: 2023-08-25

Test Laboratory: CTTL, Beijing, China DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1158 Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1 Medium parameters used: f = 1750 MHz; σ = 1.35 S/m; ϵ_r = 41.04; ρ = 1000 kg/m³ Phantom section: Right Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 SN3617; ConvF(8.4, 8.4, 8.4) @ 1750 MHz; Calibrated: 2023-03-31
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2023-01-11
- 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/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 95.63 V/m; Power Drift = 0.00 dB Peak SAR (extrapolated) = 17.0 W/kg SAR(1 g) = 9.07 W/kg; SAR(10 g) = 4.81 W/kg Smallest distance from peaks to all points 3 dB below = 10 mm Ratio of SAR at M2 to SAR at M1 = 54.2% Maximum value of SAR (measured) = 14.1 W/kg

dB -3.32 6.64 9.96 13.28 L. 16.60

0 dB = 14.1 W/kg = 11.49 dBW/kg

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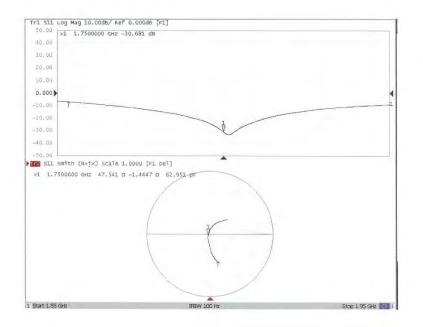






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Impedance Measurement Plot for Head TSL



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CALIBRATION CE	RTIFICAT	Έ	
Object	D2300\	/2 - SN: 1009	
Calibration Procedure(s)		-003-01 tion Procedures for dipole validation kits	
Calibration date:	August	25, 2023	
	rtificate.		ty are given on the followir
	conducted in t	he closed laboratory facility: environmen	
All calibrations have been humidity<70%.	conducted in t	he closed laboratory facility: environmen	ty are given on the followir t temperature (22±3)°C ar Scheduled Calibratio
All calibrations have been humidity<70%. Calibration Equipment used	conducted in t	he closed laboratory facility: environmen or calibration)	t temperature (22±3)°C ar
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S	conducted in t (M&TE critical fr ID # 106277 104291	he closed laboratory facility: environmen or calibration) Cal Date (Calibrated by, Certificate No.) 22-Sep-22 (CTTL, No.J22X09561) 22-Sep-22 (CTTL, No.J22X09561)	t temperature (22±3)°C ar Scheduled Calibratio Sep-23 Sep-23
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4	conducted in t (M&TE critical fr ID # 106277 104291 SN 3617	he closed laboratory facility: environmen or calibration) Cal Date (Calibrated by, Certificate No.) 22-Sep-22 (CTTL, No.J22X09561) 22-Sep-22 (CTTL, No.J22X09561) 31-Mar-23(CTTL-SPEAG,No.Z23-60161)	t temperature (22±3)°C ar Scheduled Calibratio Sep-23 Sep-23 Mar-24
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S	conducted in t (M&TE critical fr ID # 106277 104291	he closed laboratory facility: environmen or calibration) Cal Date (Calibrated by, Certificate No.) 22-Sep-22 (CTTL, No.J22X09561) 22-Sep-22 (CTTL, No.J22X09561)	t temperature (22±3)°C ar Scheduled Calibratio Sep-23 Sep-23
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All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards	conducted in t (M&TE critical fo ID # 106277 104291 SN 3617 SN 1556 ID #	he closed laboratory facility: environmen or calibration) Cal Date (Calibrated by, Certificate No.) 22-Sep-22 (CTTL, No.J22X09561) 22-Sep-22 (CTTL, No.J22X09561) 31-Mar-23(CTTL-SPEAG,No.Z23-60161) 11-Jan-23(CTTL-SPEAG,No.Z23-60034) Cal Date (Calibrated by, Certificate No.)	t temperature (22±3)°C ar Scheduled Calibratio Sep-23 Sep-23 Mar-24 Jan-24 Scheduled Calibration
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All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRP2 Power sensor NRP8S Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C	conducted in t (M&TE critical fo 106277 104291 SN 3617 SN 1556 ID # MY49071430 MY46110673	he closed laboratory facility: environmen or calibration) Cal Date (Calibrated by, Certificate No.) 22-Sep-22 (CTTL, No.J22X09561) 22-Sep-22 (CTTL, No.J22X09561) 31-Mar-23(CTTL-SPEAG,No.Z23-60161) 11-Jan-23(CTTL-SPEAG,No.Z23-60034) Cal Date (Calibrated by, Certificate No.) 05-Jan-23 (CTTL, No. J23X00107) 10-Jan-23 (CTTL, No. J23X00104)	t temperature (22±3)°C ar Scheduled Calibratio Sep-23 Sep-23 Mar-24 Jan-24 Scheduled Calibration Jan-24 Jan-24
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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:

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- 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:

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

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

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Measurement Conditions for an not shipp on page 1

DASY system configuration, as far as	not given on page 1.
DASY Version	DASY52

DAST Version	DAGTOE	OL. IG. I
Extrapolation	Advanced Extrapolation	
Phantom	Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2300 MHz ± 1 MHz	

Head TSL parameters

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.5	1.67 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.2 ± 6 %	1.66 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	250 mW input power	12.6 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	50.6 W/kg ± 18.8 % (k=2)
SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.99 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.0 W/kg ± 18.7 % (k=2)

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Appendix (Additional assessments outside the scope of CNAS L0570)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	46.6Ω- 1.60jΩ	
Return Loss	- 28.1dB	

General Antenna Parameters and Design

Electrical Delay (one direction)	1.076 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.

Additional EUT Data

Manufactured by	SPEAG

Certificate No: J23Z60373

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DASY5 Validation Report for Head TSL Test Laboratory: CTTL, Beijing, China

Date: 2023-08-25

DUT: Dipole 2300 MHz; Type: D2300V2; Serial: D2300V2 - SN: 1009 Communication System: UID 0, CW; Frequency: 2300 MHz

Medium parameters used: f = 2300 MHz; $\sigma = 1.655 \text{ S/m}$; $\varepsilon_r = 39.22$; $\rho = 1000 \text{ kg/m}^3$ Phantom section: Right Section

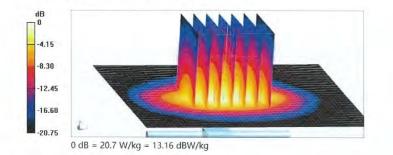
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 SN3617; ConvF(7.93, 7.93, 7.93) @ 2300 MHz; Calibrated: 2023-03-31
- Sensor-Surface: 1.4mm (Mechanical Surface Detection) .
- Electronics: DAE4 Sn1556; Calibrated: 2023-01-11 .
- 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/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 102.4 V/m; Power Drift = -0.08 dB Peak SAR (extrapolated) = 25.4 W/kg SAR(1 g) = 12.6 W/kg; SAR(10 g) = 5.99 W/kg Smallest distance from peaks to all points 3 dB below = 8.9 mm Ratio of SAR at M2 to SAR at M1 = 50.3%

Maximum value of SAR (measured) = 20.7 W/kg



Certificate No: J23Z60373

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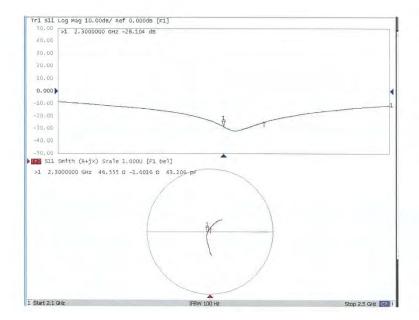
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www.sgs.com.tw
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Impedance Measurement Plot for Head TSL



Certificate No: J23Z60373

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Report No. : TESA2310000634ES Page: 21 of 26

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Service suisse d'étalonnage

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Swiss Calibration Service

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Certificate No: D3700V2-1057_Nov22

Calibration Laboratory of

Engineering AG eughausstrasse 43, 8004 Zurich, Switzerland

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Page 1 of 6

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Report No. : TESA2310000634ES Page: 22 of 26

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



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

Accreditation No.: SCS 0108

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	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:

- 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%

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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 = 4 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	3700 MHz ± 1 MHz	

Head TSL parameters

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	38.1 ± 6 %	3.08 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	100 mW input power	6.63 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	66.6 W/kg ± 19.9 % (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 100 mW input power	2.43 W/kg

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Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.7 Ω + 0.5 jΩ	
Return Loss	- 36.8 dB	

General Antenna Parameters and Design

Electrical Delay (one direction)	1.137 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
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SPEAG

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DASY5 Validation Report for Head TSL

Date: 22.11.2022

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 3700 MHz; Type: D3700V2; Serial: D3700V2 - SN:1057

Communication System: UID 0 - CW; Frequency: 3700 MHz Medium parameters used: f = 3700 MHz; $\sigma = 3.08 \text{ S/m}$; $\varepsilon_r = 38.1$; $\rho = 1000 \text{ kg/m}^3$ Phantom section: Flat Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 SN3503; ConvF(7.73, 7.73, 7.73) @ 3700 MHz; Calibrated: 08.03.2022
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 31.08.2022
- 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=100 mW, d=10mm, f=3700MHz/Zoom Scan, dist=1.4mm (8x8x8)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm Reference Value = 69.62 V/m; Power Drift = -0.08 dB Peak SAR (extrapolated) = 18.4 W/kg SAR(1 g) = 6.63 W/kg; SAR(10 g) = 2.43 W/kg Smallest distance from peaks to all points 3 dB below = 8 mm Ratio of SAR at M2 to SAR at M1 = 73.8%Maximum value of SAR (measured) = 12.6 W/kg



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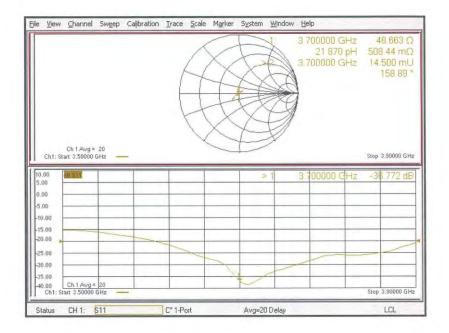
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Impedance Measurement Plot for Head TSL





- End of report -

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