

Appendix C for KSCR221000185701

Calibration Certificate

Object	Apply	No	Model	SN	Calibration Date
Dipole	☐	1	CLA150	4025	2021/04/26
	☐	2	D450V3	1103	2021/04/21
	☒	3	D750V3	1188	2022/03/29
	☒	4	D835V2	4d114	2022/03/31
	☐	5	D900V2	1d079	2022/06/07
	☒	6	D1800V2	2d170	2022/03/31
	☒	7	D1900V2	5d136	2022/06/07
	☐	8	D2000V2	1041	2022/06/06
	☐	9	D2300V2	1096	2022/03/31
	☒	10	D2450V2	817	2022/04/01
	☒	11	D2600V2	1158	2022/03/31
	☒	12	D5GHzV2	1095	2022/06/01
DAE	☒	13	DAE4	1245	2022/05/30
Probe	☒	14	EX3DV4	7346	2022/03/30



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1 Dipole

1.1 CLA150 - SN 4025

Calibration Laboratory of Schmid & Partner Engineering AG Zugstrasse 43, 8004 Zurich, Switzerland		S Schweizerischer Kalibrierdienst Service suisse d'étalonnage C Servizio svizzero di taratura S Swiss Calibration Service	
Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates		Accreditation No.: SCS 0108	
Client: SGS-CN (Audiun)		Certificate No.: CLA150-4025_Apr21	
CALIBRATION CERTIFICATE			
Object: CLA150 - SN: 4025			
Calibration procedure(s): QA CAL-15.v0 Calibration Procedure for SAR Validation Sources below 700 MHz			
Calibration date: April 26, 2021			
The calibration certificate documents the traceability to national standards, which reduce the physical units of measurements (B). 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 ± 0.5 °C and humidity < 70%).			
Calibration Equipment Used (MATE critical for calibration)			
Primary Standards	Q 1	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 10476	09-Apr-21 (No. 217-03001.03002)	Apr-22
Power sensor NRP Z01	SN: 103944	09-Apr-21 (No. 217-03001)	Apr-22
Power sensor NRP Z01	SN: 103945	09-Apr-21 (No. 217-03002)	Apr-22
Reference 20 dB Attenuator	SN: C23602 (C03)	09-Apr-21 (No. 217-03003)	Apr-22
Type-N mismatch combination	SN: 310902 / 0007	09-Apr-21 (No. 217-03004)	Apr-22
Reference Probe EX0804	SN: 3877	30-Dec-20 (No. 133-3877_Dec20)	Dec-21
IE44	SN: 661	19-Jul-20 (No. 13458-659_Jul20)	Jul-21
Secondary Standards	Q 2	Check Date (in house)	Scheduled Check
Power meter S44186	SN: G841300329	06-Apr-15 (in house check Jun-20)	In house check: Jun-20
Power sensor E413A	SN: MY41490007	06-Apr-16 (in house check Jun-20)	In house check: Jun-20
Power sensor E413A	SN: 00010010	06-Apr-16 (in house check Jun-20)	In house check: Jun-20
RF generator HP 8594C	SN: US404001709	04-Aug-09 (in house check Jun-20)	In house check: Jun-20
Network Analyzer Agilent 8720A	SN: US41000477	31-Mar-14 (in house check Oct-20)	In house check: Oct-21
Calibrated by:	Johny Katsaros	Forced:	Signature
Approved by:	Kate Polovic	Technical Manager:	Signature
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			
Issued: April 26, 2021			
Certificate No.: CLA150-4025_Apr21 Page 1 of 6			

Calibration Laboratory of Schmid & Partner Engineering AG Zugstrasse 43, 8004 Zurich, Switzerland		S Schweizerischer Kalibrierdienst Service suisse d'étalonnage C Servizio svizzero di taratura S Swiss Calibration Service	
Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates		Accreditation No.: SCS 0108	
Glossary:			
TSL	Issue 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) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013			
b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016			
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010			
d) KDB 865864, "SAR Measurement Requirements for 100 MHz to 6 GHz"			
Additional Documentation:			
e) 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 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.: CLA150-4025_Apr21 Page 2 of 6			

Measurement Conditions		
DASY system configuration, as far as not given on page 1.		
DASY Version	DASY5	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	ELIA Flat Phantom	Shell thickness: 2 ± 0.2 mm
EUT Positioning	Touch Position	
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	150 MHz ± 1 MHz	

Head TSL parameters			
The following parameters and calculations were applied.			
	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	52.3	0.75 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	51.1 ± 6 %	0.75 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL		
SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	1 W input power	3.90 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	3.88 W/kg ± 19.4 % (k=2)
SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	1 W input power	2.60 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	2.59 W/kg ± 18.0 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)	
Antenna Parameters with Head TSL	
Impedance, transformed to feed point	47.9 Ω ± 1.5 Ω
Return Loss	-31.4 dB
Additional EUT Data	
Manufactured by	SPEAG

Certificate No.: CLA150-4025_Apr21	
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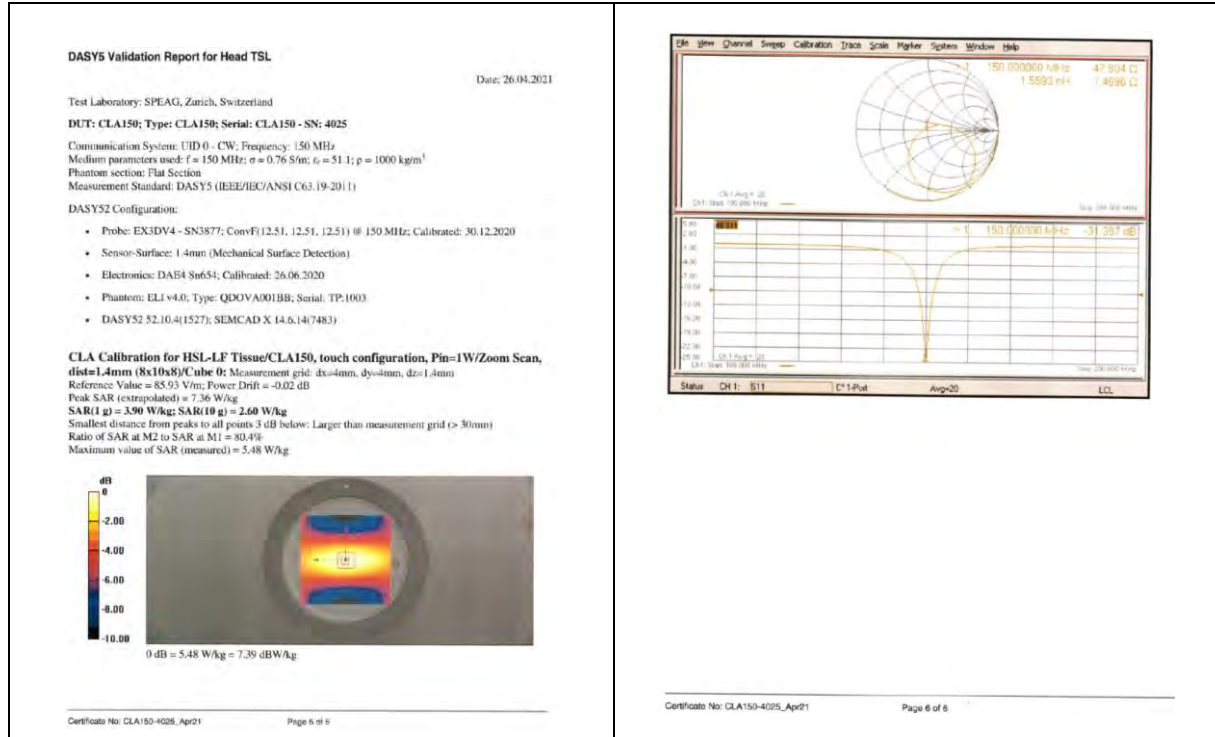


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1.2 D450V3 - SN 1103

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

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Client: **SGS-CN (Aiden)** Certificate No: **D450V3-1103_Apr21**

Accreditation No: **SCS 0108**

CALIBRATION CERTIFICATE

Object: **D450V3 - SN: 1103**

Calibration procedure(s): **QA CAL-15-V9**
Calibration Procedure for SAR Validation Sources below 700 MHz

Calibration date: **April 21, 2021**

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 (20 ± 2) °C and humidity < 75%.

Calibration Equipment used (MPE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN 104779	09-Apr-21 (No. 217-0301103020)	Apr-22
Power sensor MNP-291	SN 103244	09-Apr-21 (No. 217-030211)	Apr-22
Power sensor MNP-291	SN 103245	09-Apr-21 (No. 217-030212)	Apr-22
Reference 20 dB Attenuator	SN C2552 (200)	09-Apr-21 (No. 217-03043)	Apr-22
Type-H microwave combination	SN 310852 / 06327	09-Apr-21 (No. 217-03044)	Apr-22
Reference Probe EX3DV4	SN 3877	30-Dec-20 (No. EX3-2077 Dec21)	Dec-21
DAEA	SN 454	05-Jun-20 (No. 10454-054-Jun20)	Jun-21

Secondary Standards

ID #	Cal Date (In House)	Scheduled Check
Power meter E41488	09-Apr-21 (In house check Jun-20)	In house check Jun-21
Power sensor E41412A	09-Apr-21 (In house check Jun-20)	In house check Jun-21
Power sensor E41412A	09-Apr-21 (In house check Jun-20)	In house check Jun-21
RF generator HP 8440C	09-Apr-21 (In house check Jun-20)	In house check Jun-21
Network Analyzer Agilent E8358A	31-Mar-14 (In house check Dec-20)	In house check Oct-21

Calibrated by: **Christoph Linder** Function: **Laboratory Technician**

Approved by: **Klaus Frensch** Function: **Technical Manager**

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Accreditation No: **SCS 0108**

Glossary:

TSL: Issue simulating liquid sensitivity in TSL / NORM x,y,z

ConvF: not applicable or not measured

N/A: not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 665664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- 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 system configuration, as far as not given on page 1.		
DASY Version	DASY5	V52.10.4
Extrapolation	Advanced Extrapolation	
Phantom	ELJ4 Flat Phantom	Shell (thickness: 2 ± 0.2 mm)
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	$dx, dy, dz \leq 5$ mm	
Frequency	450 MHz ± 1 MHz	

Head TSL parameters			
The following parameters and calculations were applied:			
	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	43.5	0.57 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	43.1 ± 6 %	0.57 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	1.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	4.55 W/kg ± 18.1 % (k=2)

SAR result with Head TSL		
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	0.757 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	3.06 W/kg ± 17.6 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)		
Antenna Parameters with Head TSL		
Impedance, transformed to feed point	57.1 Ω - j2.6 Ω	
Return Loss	-23.0 dB	

General Antenna Parameters and Design	
Electrical Delay (one direction)	1.346 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 overlight coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

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

Additional EUT Data	
Manufactured by	SPEAG

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DASY5 Validation Report for Head TSL

Date: 21.04.2021

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 450 MHz; Type: D450V3; Serial: D450V3 - SN:1103

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

Medium parameters used: $f = 450$ MHz; $\alpha = 0.87$ S/m; $\epsilon_r = 43.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: EX3DV4 - SN3877; ConvF: 10.64, 10.64, 10.64 @ 450 MHz; Calibrated: 30.12.2020
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 26.06.2020
- Phantom: ELJ v4.0; Type: QDOVA001BB; Serial: TP:1003
- DASY52.10.4(1527); SEMCAD X (4.6.14)(7483)

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

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

Reference Value = 39.18 V/m; Power DUT = -0.08 dB

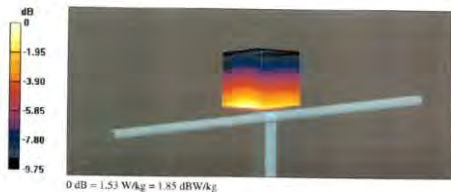
Peak SAR (extrapolated) = 1.76 W/kg

SAR(1 g) = 1.14 W/kg; SAR(10 g) = 0.767 W/kg

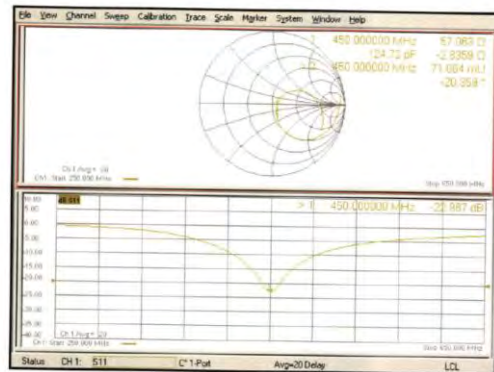
Smallest distance from peaks to all points 3 dB below: Larger than measurement grid

Ratio of SAR at M2 to SAR at M1 = 64.9%

Maximum value of SAR (measured) = 1.53 W/kg



0 dB = 1.53 W/kg = 1.85 dBW/kg



Certificate No: D450V3-1103_Apr21

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Certificate No: D450V3-1103_Apr21

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1.3 D750V3 - SN 1188

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Client: SGS-CN		Certificate No.: Z22-60103																					
CALIBRATION CERTIFICATE																							
Object: D750V3 - SN: 1188																							
Calibration Procedure(s): FF-Z11-003-01 Calibration Procedures for dipole validation kits																							
Calibration date: March 28, 2022																							
This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.																							
All calibrations have been conducted in the closed laboratory facility; environment temperature (22±3)°C and humidity <70%.																							
Calibration Equipment used (M&TE critical for calibration)																							
<table border="1"><thead><tr><th>Primary Standards</th><th>ID #</th><th>Cal Date (Calibrated by Certificate No.)</th><th>Scheduled Calibration</th></tr></thead><tbody><tr><td>Power Meter NRP2</td><td>104277</td><td>24-Sep-21 (CTTL No.J21X08328)</td><td>Sep-22</td></tr><tr><td>Power sensor NRP88</td><td>104291</td><td>24-Sep-21 (CTTL No.J21X08328)</td><td>Sep-22</td></tr><tr><td>Reference Probe EX30V4</td><td>SN 7307</td><td>26-May-21 (SPEAG No.EX3-7307_May21)</td><td>May-22</td></tr><tr><td>DAE4</td><td>SN 1556</td><td>12-Jan-22 (CTTL-SPEAG No.Z22-60007)</td><td>Jan-23</td></tr></tbody></table>				Primary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration	Power Meter NRP2	104277	24-Sep-21 (CTTL No.J21X08328)	Sep-22	Power sensor NRP88	104291	24-Sep-21 (CTTL No.J21X08328)	Sep-22	Reference Probe EX30V4	SN 7307	26-May-21 (SPEAG No.EX3-7307_May21)	May-22	DAE4	SN 1556	12-Jan-22 (CTTL-SPEAG No.Z22-60007)	Jan-23
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Power Meter NRP2	104277	24-Sep-21 (CTTL No.J21X08328)	Sep-22																				
Power sensor NRP88	104291	24-Sep-21 (CTTL No.J21X08328)	Sep-22																				
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<table border="1"><thead><tr><th>Secondary Standards</th><th>ID #</th><th>Cal Date (Calibrated by Certificate No.)</th><th>Scheduled Calibration</th></tr></thead><tbody><tr><td>Signal Generator S4436C</td><td>MY46071430</td><td>13-Jan-22 (CTTL No.J22X00409)</td><td>Jan-23</td></tr><tr><td>Network Analyzer E5071C</td><td>MY46110673</td><td>14-Jan-22 (CTTL No.J22X00409)</td><td>Jan-23</td></tr></tbody></table>				Secondary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration	Signal Generator S4436C	MY46071430	13-Jan-22 (CTTL No.J22X00409)	Jan-23	Network Analyzer E5071C	MY46110673	14-Jan-22 (CTTL No.J22X00409)	Jan-23								
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Calibrated by: Zhao Jing SAR Test Engineer		Signature: [Signature]																					
Reviewed by: Lin Hao SAR Test Engineer		Signature: [Signature]																					
Approved by: Qi Dianyun SAR Project Leader		Signature: [Signature]																					
Issued: April 3, 2022																							
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Measurement Conditions DASY system configuration, as far as not given on page 1:			
DASY Version		DASY52	
Extrapolation		Advanced Extrapolation	
Phantom		Triple Flat Phantom 5.1C	
Distance Dipole Center - TSL		15 mm with Spacer	
Zoom Scan Resolution		dx, dy, dz = 5 mm	
Frequency		750 MHz ± 1 MHz	
Head TSL parameters The following parameters and calculations were applied:			
Temperature		22.0 °C	
Permittivity		42.0	
Conductivity		0.90 mho/m	
Nominal Head TSL parameters		(22.0 ± 0.2) °C	
Measured Head TSL parameters		(22.0 ± 0.2) °C	
Head TSL temperature change during test		<1.0 °C	
SAR result with Head TSL			
SAR averaged over 1 cm ² (1 g) of Head TSL		Condition	
SAR measured		250 mW input power	
SAR for nominal Head TSL parameters		normalized to 1W	
SAR averaged over 10 cm ² (10 g) of Head TSL		Condition	
SAR measured		250 mW input power	
SAR for nominal Head TSL parameters		normalized to 1W	

TTL Speag CALIBRATION LABORATORY		CAICT	
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Appendix (Additional assessments outside the scope of CNAS L0570)			
Antenna Parameters with Head TSL			
Impedance, transformed to feed point		53.60 - 1.13jΩ	
Return Loss		-28.7dB	
General Antenna Parameters and Design			
Electrical Delay (one direction)		0.947 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 and caps are added to the dipole arms in order to improve matching when tested 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: Z22-60103		Page 4 of 6	

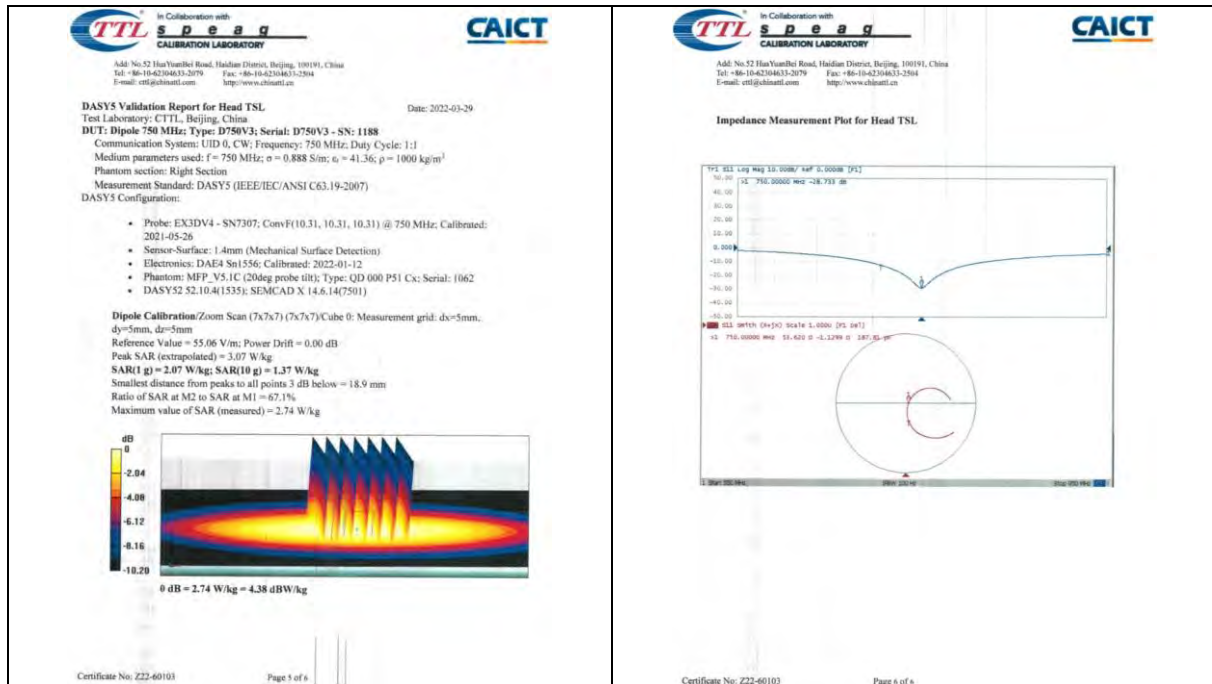


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1.4 D835V2 - SN 4d114

TTS Calibration Laboratory		CAICT																					
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Client: SGS-CN		Certificate No: Z22-60104																					
CALIBRATION CERTIFICATE																							
Object: D835V2 - SN: 4d114																							
Calibration Procedure(s): FF-Z11-003-01 Calibration Procedures for dipole validation kits																							
Calibration date: March 31, 2022																							
This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.																							
All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)°C and humidity <70%.																							
Calibration Equipment used (M&E critical for calibration)																							
<table border="1"><thead><tr><th>Primary Standards</th><th>ID #</th><th>Cal Date (Calibrated by Certificate No.)</th><th>Scheduled Calibration</th></tr></thead><tbody><tr><td>Power Meter: NRP2</td><td>106277</td><td>24-Sep-21 (CTTL No.J21X08326)</td><td>Sep-22</td></tr><tr><td>Power sensor: NRPBS</td><td>104281</td><td>24-Sep-21 (CTTL No.J21X08326)</td><td>Sep-22</td></tr><tr><td>Reference Probe EX3DV4</td><td>SN 7307</td><td>26-May-21 (SPEAG No. EX3-7307_May21)</td><td>May-22</td></tr><tr><td>DAE4</td><td>SN 1556</td><td>12-Jan-22 (CTTL-SPEAG No. Z22-60007)</td><td>Jan-23</td></tr></tbody></table>				Primary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration	Power Meter: NRP2	106277	24-Sep-21 (CTTL No.J21X08326)	Sep-22	Power sensor: NRPBS	104281	24-Sep-21 (CTTL No.J21X08326)	Sep-22	Reference Probe EX3DV4	SN 7307	26-May-21 (SPEAG No. EX3-7307_May21)	May-22	DAE4	SN 1556	12-Jan-22 (CTTL-SPEAG No. Z22-60007)	Jan-23
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Calibrated by: Zhao Jing, SAR Test Engineer																							
Reviewed by: Lin Hao, SAR Test Engineer																							
Approved by: Qi Dianyan, SAR Project Leader																							
Issued: April 6, 2022																							
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Glossary:
TSL: tissue simulating liquid
ConvF: sensitivity in TSL / NORMx.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-mounted Wireless Communication Devices-Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020
b) KDB 689864, "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 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: Z22-60104 Page 2 of 5

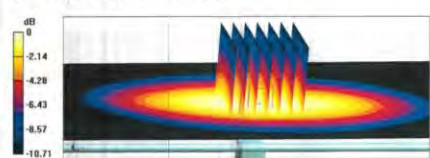


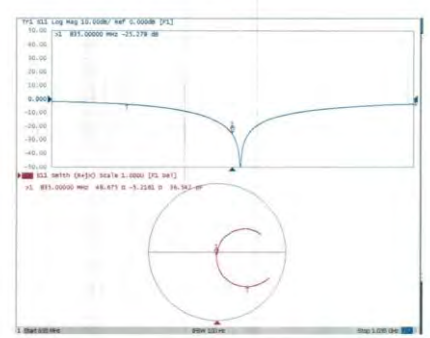
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Measurement Conditions DASY system configuration, as far as not given on page 1			
DASY Version	DASY52	VS2 10.4	
Extrapolation	Advanced Extrapolation		
Phantom	Triple Flat Phantom 5.1C		
Distance Dipole Center - TSL	15 mm	with Spacer	
Zoom Scan Resolution	dx, dy, dz = 5 mm		
Frequency	835 MHz ± 1 MHz		
Head TSL parameters The following parameters and calculations were applied:			
	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.0 ± 0.5	0.91 mho/m ± 0.5 %
Head TSL temperature change during last	< 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	2.37 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	9.40 W/kg ± 18.8 % (k=2)	
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition		
SAR measured	250 mW input power	1.54 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	6.12 W/kg ± 18.7 % (k=2)	
Appendix (Additional assessments outside the scope of CNAS L0570)			
Antenna Parameters with Head TSL			
Impedance, transformed to feed point	48.70 - j22.0Ω		
Return Loss	-25.3dB		
General Antenna Parameters and Design			
Electrical Delay (one direction)	1.307 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: Z22-60104 Page 1 of 6			

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DASY Validation Report for Head TSL Test Laboratory: CTTL, Beijing, China Date: 2022-03-31			
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 40114 Communication System: UTD 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1 Medium parameters used: f = 835 MHz; σ = 0.907 S/m; ε = 40.98; ρ = 1000 kg/m ³ Phantom section: Right Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007) DASY5 Configuration:			
- Probe: EX3DV4 - SN7307; ConvF(10.13, 10.13, 10.13) @ 835 MHz; Calibrated: 2021-05-26 - Sensor Surface: 1.4mm (Mechanical Surface Detection) - Electronics: DA64 Sn1556; Calibrated: 2022-01-12 - Phantom: MFP_V5.1C (20deg probe til); Type: QD 000 P51 Cx; Serial: 1062 - DASY52 52.10.4(153); SEMCAD X 14.6.14(7501)			
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7) Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 57.88 V/m; Power Drift = 0.04 dB Peak SAR (extrapolated) = 3.56 W/kg SAR(1 g) = 2.37 W/kg; SAR(10 g) = 1.54 W/kg Smallest distance from peaks to all points 3 dB below = 15.8 mm Ratio of SAR at M2 to SAR at M1 = 66.2% Maximum value of SAR (measured) = 3.17 W/kg			
			
0 dB = 3.17 W/kg = 5.01 dBW/kg			
Certificate No: Z22-60104 Page 5 of 6			

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Impedance Measurement Plot for Head TSL			
			
Certificate No: Z22-60104 Page 6 of 6			



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1.5 D900V2 - SN 1d079

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Client: SGS-CN		Certificate No: Z22-60184																					
CALIBRATION CERTIFICATE																							
Object: D900V2 - SN 1d079																							
Calibration Procedure(s): PF-Z11-003-01 Calibration Procedures for dipole validation kits																							
Calibration date: June 7, 2022																							
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 (23±1)°C and humidity 70%.																							
Calibration Equipment used (M&E critical for calibration)																							
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Calibrated by: Name: Zhao Jing, Function: SAR Test Engineer, Signature: [Signature]																							
Reviewed by: Lin Hao, SAR Test Engineer, Signature: [Signature]																							
Approved by: Qi Dianyan, SAR Project Leader, Signature: [Signature]																							
Issued: June 13, 2022																							
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Measurement Conditions DASY system configuration, as far as is given on page 1																					
<table border="1"><thead><tr><th>DASY Version</th><th>DASY2</th><th>52.10.4</th></tr></thead><tbody><tr><td>Extrapolation</td><td>Advanced Extrapolation</td><td></td></tr><tr><td>Phantom</td><td>Triple Flat Phantom 5.1C</td><td></td></tr><tr><td>Distance Dipole Center - TSL</td><td>15 mm</td><td>with Spacer</td></tr><tr><td>Zoom Scan Resolution</td><td>0x, dy, dz = 5 mm</td><td></td></tr><tr><td>Frequency</td><td>900 MHz ± 1 MHz</td><td></td></tr></tbody></table>				DASY Version	DASY2	52.10.4	Extrapolation	Advanced Extrapolation		Phantom	Triple Flat Phantom 5.1C		Distance Dipole Center - TSL	15 mm	with Spacer	Zoom Scan Resolution	0x, dy, dz = 5 mm		Frequency	900 MHz ± 1 MHz	
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Certificate No: Z22-60184		Page 1 of 6																			

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Glossary: TSL: tissue simulating liquid ConvF: sensitivity in TSL / NORM.y,z N/A: not applicable or not measured			
Calibration is Performed According to the Following Standards: a) IEC/IEEE 62209-1529, "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 1529: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020 b) KDB 865684, "SAR Measurement Requirements for 100 MHz to 6 GHz" c) DASY4S System Handbook			
Additional Documentation: c) DASY4S System Handbook			
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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: Z22-60184		Page 1 of 6	

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After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured.									
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Certificate No: Z22-60184		Page 1 of 6							

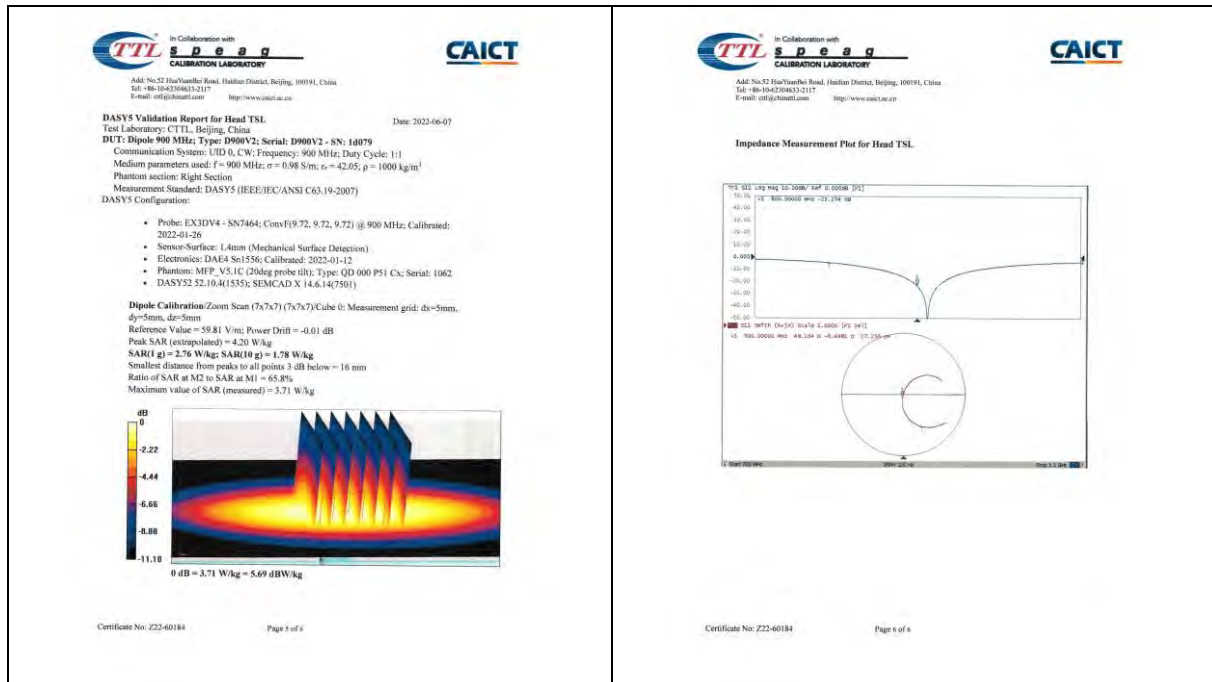


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1.6 D1800V2 - SN 2d170

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http://www.china.ttl.com.cn

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Client: **SGS-CN** Certificate No: **Z22-60105**

CALIBRATION CERTIFICATE

Object: **D1800V2 - SN: 2d170**

Calibration Procedure(s): **FF-Z11-003-01**
Calibration Procedures for dipole validation kits

Calibration date: **March 31, 2022**

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility, environment temperature (22±3)°C and humidity <70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	24-Sep-21 (CTTL No.J21X05326)	Sep-22
Power sensor NRP6S	104291	24-Sep-21 (CTTL No.J21X05326)	Sep-22
Reference Probe EX3DV4	SN 7307	26-May-21 (SPEAG No.EX3-7307_May21)	May-22
DAE4	SN 1556	12-Jan-22 (CTTL-SPEAG No.Z22-60007)	Jan-23

Secondary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	13-Jan-22 (CTTL No.J22X00409)	Jan-23
Network Analyzer E5071C	MY48110673	14-Jan-22 (CTTL No.J22X00409)	Jan-23

Calibrated by: **Zhao Jing** SAR Test Engineer
Reviewed by: **Lin Hao** SAR Test Engineer
Approved by: **Qi Dianyan** SAR Project Leader

Issued: April 6, 2022
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Certificate No: Z22-60105 Page 1 of 6

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Glossary:
TSL: tissue simulating liquid
ConvF: sensitivity in TSL / NORM_{x,y,z}
N/A: not applicable or not measured

Calibration is Performed According to the Following Standards:
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 855664, "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.
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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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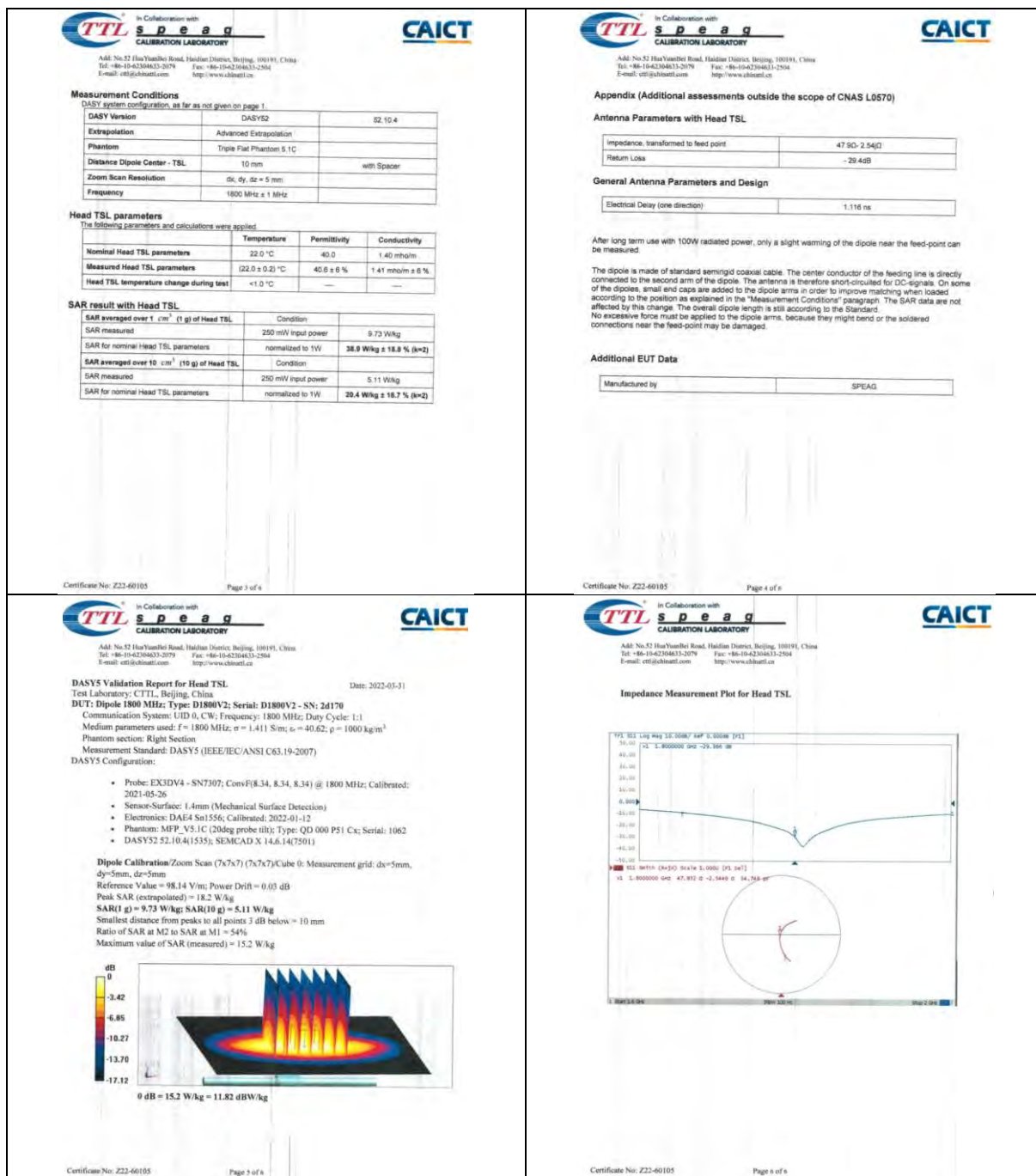


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1.7 D1900V2 - SN 5d136

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Client: SGS-CN		Certificate No: Z22-60185																					
CALIBRATION CERTIFICATE																							
Object: D1900V2 - SN 5d136																							
Calibration Procedure(s): FF-Z11-003-01 Calibration Procedures for dipole validation kits																							
Calibration date: June 7, 2022																							
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 (23±1)°C and humidity <70%.																							
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Calibrated by: Name: Zhao Jing, Function: SAR Test Engineer, Signature: [Signature]																							
Reviewed by: Name: Lin Hao, Function: SAR Test Engineer, Signature: [Signature]																							
Approved by: Name: Qi Diqian, Function: SAR Project Leader, Signature: [Signature]																							
Issued: June 13, 2022																							
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Glossary:			
TSL		Issue simulating liquid	
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b) KDB 855884, "SAR Measurement Requirements for 100 MHz to 6 GHz"			
Additional Documentation:			
c) DASY4/S 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.			
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Certificate No: Z22-60185		Page 2 of 4	

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Certificate No: Z22-60185		Page 3 of 4																						

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<table border="1"><thead><tr><th>Parameter</th><th>Value</th></tr></thead><tbody><tr><td>Impedance, transformed to feed point</td><td>51.0Ω ± 1.5Ω (k=2)</td></tr><tr><td>Return Loss</td><td>22.4dB</td></tr></tbody></table>				Parameter	Value	Impedance, transformed to feed point	51.0Ω ± 1.5Ω (k=2)	Return Loss	22.4dB
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Parameter	Value								
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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 caps are added to the dipole arms in order to improve matching when loaded according to the position as specified 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.									
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	SPEAG								
Certificate No: Z22-60185		Page 4 of 4							

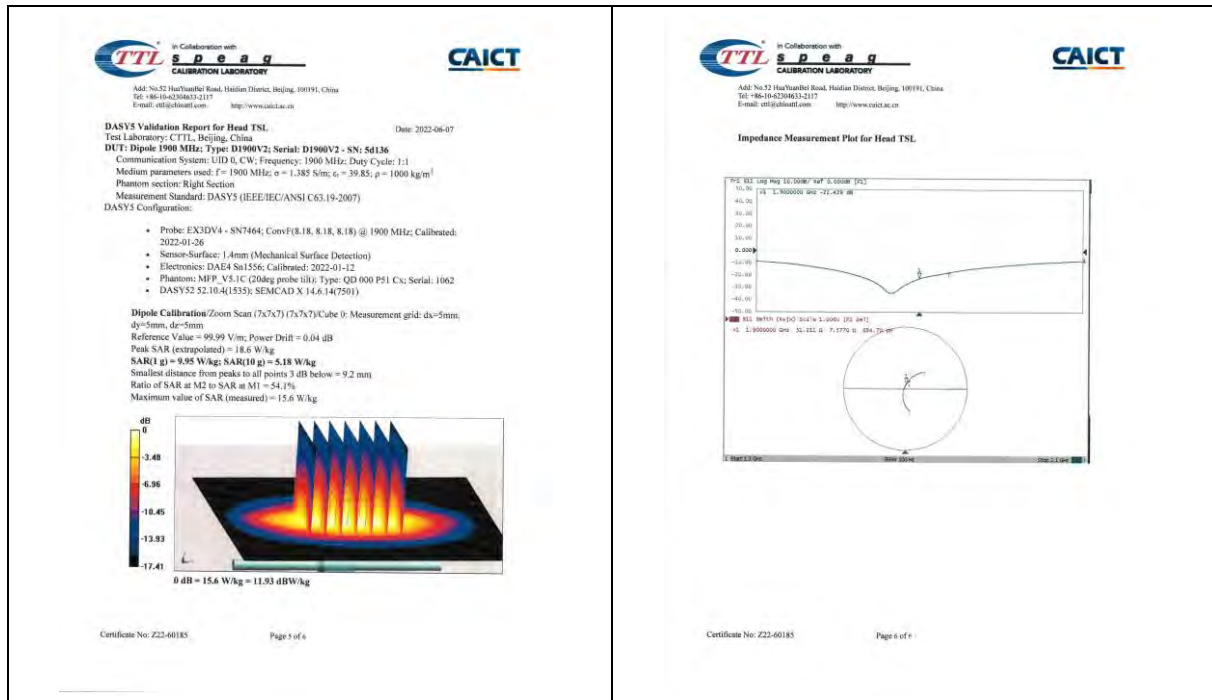


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1.8 D2000V2 - SN 1041

TTLSPEAG Calibration Laboratory
CAICT

Address: No. 52 Huaiyuan Road, Huaiyin District, Beijing, 100191, China
Tel: +86-10-6208633-3117
E-mail: cti@sgs.com.cn

Client: SGS-CN Certificate No: Z22-60186

CALIBRATION CERTIFICATE

Object: D2000V2 - SN: 1041

Calibration Procedure(s): FF-Z11-003-01
Calibration Procedure for dipole validation kits

Calibration date: June 6, 2022

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 (23±3)°C and humidity <70%.

Calibration Equipment used (MATE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	24-Sep-21 (CTTL No. J21K08328)	Sep-22
Power sensor NRP5	104291	24-Sep-21 (CTTL No. J21K08328)	Sep-22
Reference Probe EX3DV4	SN 7464	26-Jan-22 (SPEAG No. EX3-7464-Jan22)	Jan-23
DAE4	SN 1556	12-Jan-22 (CTTL-SPEAG No. Z22-60007)	Jan-23

Secondary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY49071430	13-Jan-22 (CTTL No. Z22K00408)	Jan-23
Network Analyzer E5071C	MY46110673	14-Jan-22 (CTTL No. Z22K00408)	Jan-23

Calibrated by: Zhao Jing SAR Test Engineer
Reviewed by: Lin Hao SAR Test Engineer
Approved by: Qi Dianyan SAR Project Leader

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Certificate No: Z22-60186 Page 1 of 6

TTLSPEAG Calibration Laboratory
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Tel: +86-10-6208633-3117
E-mail: cti@sgs.com.cn

Glossary:
TSL: Issue simulating liquid
ConvF: sensitivity in TSL / NORMx.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-Head 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 865564, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:
c) DASY5 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 Parameter 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: Z22-60186 Page 2 of 6



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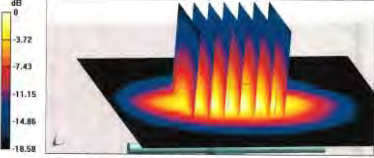
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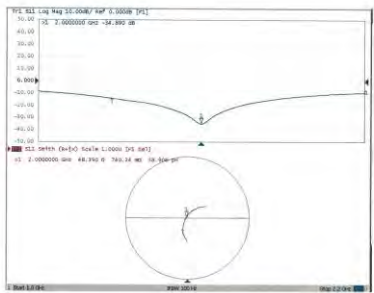
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Measurement Conditions DASY system configuration, as for as not given on page 1.			
DASY Version	DASYV2	52.10.4	
Extrapolation	Advanced Extrapolation		
Phantom	Triple Flat Phantom S.1C		
Distance Dipole Center - TSL	10 mm	with Spacer	
Zoom Scan Resolution	dx, dy, dz = 5 mm		
Frequency	2000 MHz ± 1 MHz		
Head TSL parameters The following parameters and calculations were applied:			
Nominal Head TSL parameters	Temperature	Permittivity	Conductivity
	22.9 °C	40.0	1.40 mho/cm
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.2 ± 0.6 %	1.36 mho/cm ± 0.6 %
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	10.4 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	41.8 W/kg ± 15.8 % (n=2)	
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition		
SAR measured	250 mW input power	5.30 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	21.3 W/kg ± 18.7 % (n=2)	
Certificate No: Z22-60186 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	48.4Ω ± 0.74Ω		
Return Loss	-34.8dB		
General Antenna Parameters and Design			
Electrical Delay (one direction)	1.08 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 serrigrid 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 and large 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: Z22-60186 Page 4 of 6			

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Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China Tel: +86-10-6208632-2117 E-mail: info@ttml.com http://www.ttml.com.cn			
DASY Validation Report for Head TSL Test Laboratory: CTTL, Beijing, China DUT: Dipole 2000 MHz; Type: D2000V2; Serial: D2000V2 - SN: 1041 Communication System: UTD 0; CW; Frequency: 2000 MHz; Duty Cycle: 1:1 Medium parameters used: f = 2000 MHz; σ = 1.392 S/m; ε = 40.21; ρ = 1000 kg/m ³ Phantom section: Right Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007) DASY5 Configuration:			
• Probe: EX3DV4 - SN7464; ConvF(R2, R2, R2) @ 2000 MHz; Calibrated: 2022-01-26			
• Sensor Surface: 1.4mm (Mechanical Surface Detection)			
• Electronics: DA64 Sn1556; Calibrated: 2022-01-12			
• Phantom: MPP_V5.1C (20kg probe kit); Type: QD 000 P51 Cx; Serial: 1062			
• DASY5: S2.10.6(41555); SEMCAD X 14.6.14(75901)			
Dipole Calibration/Zoom Scan (7x7x7) (7x7x7) Cube 0; Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 103.4 V/m; Power Drift = 0.03 dB Peak SAR (extrapolated) = 19.6 W/kg SAR(1 g) = 10.4 W/kg; SAR(10 g) = 5.3 W/kg Smallest distance from peaks to all points 3 dB below = 9.1 mm Ratio of SAR at M2 to SAR at M1 = 51.0%			
Maximum value of SAR (measured) = 16.3 W/kg			
			
Certificate No: Z22-60186 Page 5 of 6			

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Impedance Measurement Plot for Head TSL			
			
Certificate No: Z22-60186 Page 6 of 6			

1.9 D2300V2 - SN 1096

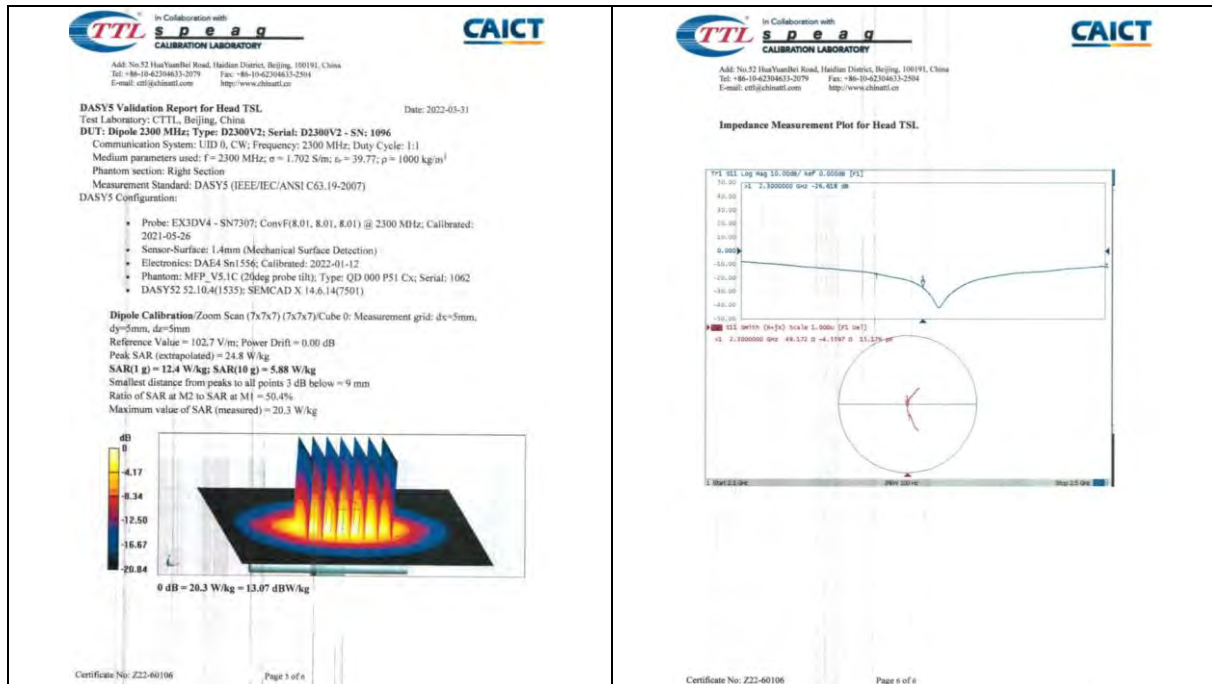
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Client	SGS-CN	Certificate No.	Z22-60106
CALIBRATION CERTIFICATE			
Object	D2300V2 - SN 1096		
Calibration Procedure(s)	FF-Z11-003-01 Calibration Procedures for dipole validation kits		
Calibration date:	March 31, 2022		
This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.			
All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)°C and humidity <70%.			
Calibration Equipment used (M&TE critical for calibration)			
Primary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	24-Sep-21 (CTTL No.J21X08328)	Sep-22
Power sensor NRP8	104291	24-Sep-21 (CTTL No.J21X08328)	Sep-22
Reference Probe EX30V4	SN 7307	26-May-21 (SPEAG No.EK3-7307_May21)	May-22
DA4	SN 1556	12-Jan-22 (CTTL-SPEAG No.Z22-60007)	Jan-23
Secondary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Signal Generator E4439C	MY49071430	13-Jan-22 (CTTL No.J22X00406)	Jan-23
Network Analyzer E5071C	MY48110673	14-Jan-22 (CTTL No.J22X00406)	Jan-23
Calibrated by:	Name	Function	Signature
	Zhao Jing	SAR Test Engineer	
Reviewed by:	Lin Hao	SAR Test Engineer	
Approved by:	Qi Diqian	SAR Project Leader	
Issued: April 6, 2022			
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Measurement Conditions DASY system configuration, as far as not given on page 1:			
DASY Version	DASY2	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		
Frequency	2300 MHz ± 1 MHz		
Head TSL parameters The following parameters and calculations were applied:			
	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	39.8 ± 9 %	1.70 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	—	—
SAR result with Head TSL			
SAR averaged over 1 cm ² (1 g) of Head TSL	Condition		
SAR measured	250 mW input power	12.4 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	49.2 W/kg ± 18.8 % (k=2)	
SAR averaged over 10 cm ² (10 g) of Head TSL	Condition		
SAR measured	250 mW input power	5.88 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	23.4 W/kg ± 18.7 % (k=2)	
Certificate No: Z22-60106		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	49.20 - 4.56jΩ		
Return Loss	-25.6dB		
General Antenna Parameters and Design			
Electrical Delay (one direction)	1.083 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: Z22-60106		Page 4 of 6	



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1.10 D2450V2 - SN 817

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E-mail: cti@china.ttl.com http://www.china.ttl.com

Client: **SGS-CN** Certificate No: **Z22-60107**

CALIBRATION CERTIFICATE

Object: **D2450V2 - SN 817**

Calibration Procedure(s): **FF-Z1(1-003-3)**
Calibration Procedures for dipole validation kits

Calibration date: **April 1, 2022**

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements [B]. The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)°C and humidity <70%.

Calibration Equipment used (M&E critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Power Meter: NRP2	106277	24-Sep-21 (CTTL No.J21X08326)	Sep-22
Power sensor: NRP8S	104291	24-Sep-21 (CTTL No.J21X08326)	Sep-22
Reference Probe EX3DV4	SN 7307	25-May-21 (SPEAG No EX3-7307_May21)	May-22
DAE4	SN 1555	12-Jan-22 (CTTL-SPEAG No Z22-60007)	Jan-23

Secondary Standards	ID #	Cal Date (Calibrated by Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY40071430	13-Jan-22 (CTTL No.J22X00406)	Jan-23
Network Analyzer E5071C	MY46110673	14-Jan-22 (CTTL No.J22X00406)	Jan-23

Calibrated by: **Zhao Jing** SAR Test Engineer
Reviewed by: **Liu Hao** SAR Test Engineer
Approved by: **Qi Dianyan** SAR Project Leader

Issued: April 6, 2022

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Certificate No: Z22-60107 Page 1 of 6

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Glossary:

TSL: tissue simulating liquid
ConvF: sensitivity in TSL / NORMx.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-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020
b) KDB 865684, "SAR Measurement Requirements for 100 MHz to 5 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: Z22-60107 Page 2 of 6



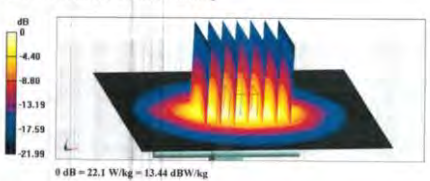
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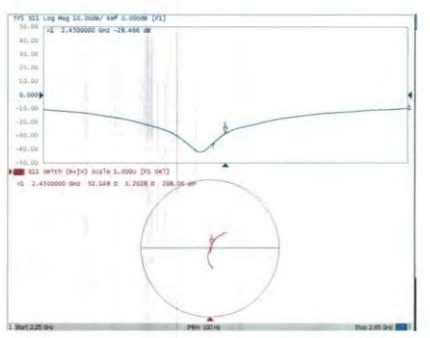
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Measurement Conditions DASY system configuration, as far as not given on page 1:			
DASY Version	DASY52	52.10.4	
Extrapolation	Advanced Extrapolation		
Phantom	Triple Flat Phantom 5.1C		
Distance Dipole Center - TSL	10 mm	with Spacer	
Zoom Scan Resolution	dx, dy, dz = 5 mm		
Frequency	2450 MHz ± 1 MHz		
Head TSL parameters The following parameters and calculations were applied:			
Nominal Head TSL parameters	Temperature	Permittivity	Conductivity
	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.5 ± 6 %	1.79 mho/m ± 8 %
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	13.2 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	53.0 W/kg ± 18.8 % (k=2)	
SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition		
SAR measured	250 mW input power	6.15 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	24.7 W/kg ± 18.7 % (k=2)	
Appendix (Additional assessments outside the scope of CNAS L0570)			
Antenna Parameters with Head TSL			
Impedance, transformed to feed point	52.10 ± 3.23Ω		
Return Loss	~26.5dB		
General Antenna Parameters and Design			
Electrical Delay (one direction)	1.006 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 serringid 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: Z22-40107 Page 4 of 6			

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DASY5 Validation Report for Head TSL Test Laboratory: CTTL, Beijing, China Date: 2022-04-01 DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 817 Communication System: UTD 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1 Medium parameters used: f = 2450 MHz; σ = 1.79 S/m; ε = 39.52; ρ = 1000 kg/m ³ Phantom section: Right Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007) DASY5 Configuration: - Probe: EX3DV4 - SN7307; ConvF(7.75, 7.75) @ 2450 MHz; Calibrated: 2021-05-26 - Sensor-Surface: 1.4mm (Mechanical Surface Detection) - Electronics: DA14 Snt1556; Calibrated: 2022-01-12 - Phantom: MFP-V5.1C (20kg 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 = 104.6 V/m; Power Drift = -0.03 dB Peak SAR (extrapolated) = 27.0 W/kg SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.15 W/kg Smallest distance from peaks to all points 3 dB below = 8.9 mm Ratio of SAR at M2 to SAR at M1 = -49.2% Maximum value of SAR (measured) = 22.1 W/kg			
			
Certificate No: Z22-40107 Page 5 of 6			

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Impedance Measurement Plot for Head TSL			
			
Certificate No: Z22-40107 Page 6 of 6			



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1.11 D2600V2 - SN 1158

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Client: SGS-CN		Certificate No: Z22-60108																					
CALIBRATION CERTIFICATE																							
Object: D2600V2 - SN: 1158																							
Calibration Procedure(s): FF-Z11-003-01 Calibration Procedures for dipole validation kits																							
Calibration date: March 31, 2022																							
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 (23±3)°C and humidity<70%.																							
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Reviewed by: Lin Hao SAR Test Engineer																							
Approved by: Qi Dianyan SAR Project Leader																							
Issued: April 6, 2022																							
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Measurement Conditions DASY system configuration, as far as not given on page 1:																								
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Head TSL parameters The following parameters and calculations were applied:																								
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Glossary: TSL tissue simulating liquid ConvF sensitivity in TSL / NORMx.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-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/S 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: Z22-60108		Page 2 of 6	

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Appendix (Additional assessments outside the scope of CNAS L0570)							
Antenna Parameters with Head TSL							
<table border="1"><thead><tr><th>Impedance, transformed to feed point</th><th>49.90 - 6.49jΩ</th></tr></thead><tbody><tr><td>Return Loss</td><td>-23.8dB</td></tr></tbody></table>				Impedance, transformed to feed point	49.90 - 6.49jΩ	Return Loss	-23.8dB
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Electrical Delay (one direction)	1.053 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							
<table border="1"><thead><tr><th>Manufactured by</th><th>SPEAG</th></tr></thead></table>				Manufactured by	SPEAG		
Manufactured by	SPEAG						
Certificate No: Z22-60108		Page 3 of 6					

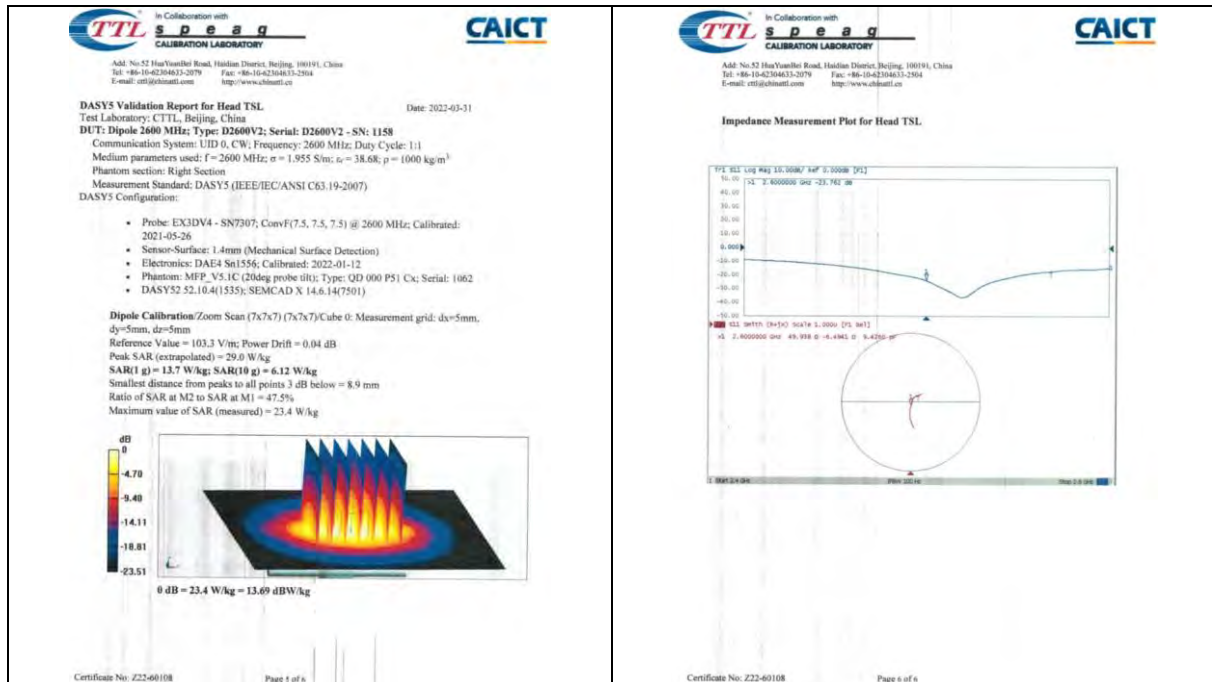


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1.12 D5GHZV2 - SN 1095

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Client: SGS-CN Certificate No: Z22-60187

CALIBRATION CERTIFICATE

Object: D5GHZV2 - SN 1095

Calibration Procedure(s): FF-Z11-003-01
Calibration Procedures for dipole validation kit

Calibration date: June 1, 2022

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 (23±1)°C and humidity <70%.

Calibration Equipment used (MSTE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by: Certificate No.)	Scheduled Calibration
Power Meter NRP2	106277	24-Sep-21 (CTTL No.J2100328)	Sep-22
Power sensor NRP8	104291	24-Sep-21 (CTTL No.J2100328)	Sep-22
Reference Probe EX3DV4	SN 7464	26-Jan-22(SPEAG No EX3-7464, Jan22)	Jan-23
DA64	SN 1556	12-Jan-22(CTTL-SPEAG No Z22-60007)	Jan-23

Secondary Standards	ID #	Cal Date (Calibrated by: Certificate No.)	Scheduled Calibration
Signal Generator E4438C	MY48071430	13-Jan-22 (CTTL No. J22000409)	Jan-23
Network Analyzer E5071C	MY46110673	14-Jan-22 (CTTL No. J22000406)	Jan-23

Calibrated by: Zhao Jing SAR Test Engineer

Reviewed by: Lin Hao SAR Test Engineer

Approved by: Qi Dianyan SAR Project Leader

Issued: June 8, 2022

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Glossary:

TSL: Issue simulating liquid

CompF: 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-mounted Wireless Communication Devices-Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020

b) KDB 665664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

c) DASY45 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 station 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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Add: No.52 HuaYuanDi Road, Haidian District, Beijing, 100191, China Tel: +86-10-62362117 E-mail: csl@ttsl.com.cn http://www.ttsl.com.cn		Add: No.52 HuaYuanDi Road, Haidian District, Beijing, 100191, China Tel: +86-10-62362117 E-mail: csl@ttsl.com.cn http://www.caict.ac.cn	
Measurement Conditions SAR system configuration, as for as not given on page 1.			
DASY Version	DASY2	52.10.4	
Extrapolation	Advanced Extrapolation		
Phantom	Triple Flat Phantom S1C		
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	500 MHz ± 1 MHz 600 MHz ± 1 MHz 3500 MHz ± 1 MHz 5600 MHz ± 1 MHz		

Head TSL parameters at 5200MHz The following parameters and calculations were applied.			
	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.2 ± 5 %	4.73 mho/m ± 5 %
Head TSL temperature change during test	<1.0 °C	—	—

SAR result with Head TSL at 5200MHz			
SAR averaged over 1 cm ² (1 g) of Head TSL	Condition		
SAR measured	250 mW input power	7.75 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	77.8 W/kg ± 24.4 % (k=2)	
SAR averaged over 10 cm ² (10 g) of Head TSL	Condition		
SAR measured	250 mW input power	2.22 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	22.1 W/kg ± 24.2 % (k=2)	

Head TSL parameters at 5500MHz The following parameters and calculations were applied.			
	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.8	4.88 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.8 ± 5 %	4.84 mho/m ± 5 %
Head TSL temperature change during test	<1.0 °C	—	—

SAR result with Head TSL at 5500MHz			
SAR averaged over 1 cm ² (1 g) of Head TSL	Condition		
SAR measured	100 mW input power	7.84 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	78.1 W/kg ± 24.4 % (k=2)	
SAR averaged over 10 cm ² (10 g) of Head TSL	Condition		
SAR measured	100 mW input power	2.27 W/kg	
SAR for nominal Head TSL parameters	normalized to 1W	22.6 W/kg ± 24.2 % (k=2)	

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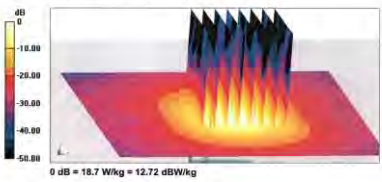
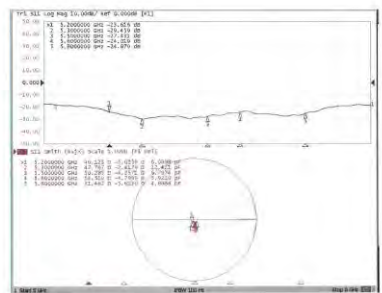


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In Collaboration with TTL speaq CALIBRATION LABORATORY CAICT Address: No.52 Huayuan Road, Haidian District, Beijing, 100191, China Tel: +86-10-62302117 E-mail: cti@speaq.com http://www.speaq.com General Antenna Parameters and Design Electrical Delay (one direction): 1.021 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 carrier conductor of the feeding line is directly connected to the second arm of the dipole. This 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: SPEAQ Certificate No: Z22-60187 Page 1 of 6	In Collaboration with TTL speaq CALIBRATION LABORATORY CAICT Address: No.52 Huayuan Road, Haidian District, Beijing, 100191, China Tel: +86-10-62302117 E-mail: cti@speaq.com http://www.speaq.com DASY5 Validation Report for Head TSL Test Laboratory: CTTL, Beijing, China Date: 2022-09-01 DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1095 Communication System: CW; Frequency: 5200 MHz; Frequency: 5300 MHz; Frequency: 5500 MHz; Frequency: 5600 MHz; Frequency: 5800 MHz; Duty Cycle: 1:1 Medium parameters used: $f = 5200 \text{ MHz}$; $\sigma = 4.82 \text{ S/m}$; $\epsilon = 35.39$; $\rho = 1000 \text{ kg/m}^3$ Medium parameters used: $f = 5300 \text{ MHz}$; $\sigma = 4.73 \text{ S/m}$; $\epsilon = 35.19$; $\rho = 1000 \text{ kg/m}^3$ Medium parameters used: $f = 5500 \text{ MHz}$; $\sigma = 4.939 \text{ S/m}$; $\epsilon = 34.83$; $\rho = 1000 \text{ kg/m}^3$ Medium parameters used: $f = 5600 \text{ MHz}$; $\sigma = 5.051 \text{ S/m}$; $\epsilon = 34.89$; $\rho = 1000 \text{ kg/m}^3$ Medium parameters used: $f = 5800 \text{ MHz}$; $\sigma = 5.247 \text{ S/m}$; $\epsilon = 34.42$; $\rho = 1000 \text{ kg/m}^3$ Phantom section: Right Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C38.19-2007) DASY5 Configuration: - Probe: EX3DV4 - SN7484; ConvF(5.6, 5.6) @ 5200 MHz; ConvF(5.32, 5.32) @ 5300 MHz; ConvF(5.11, 5.11) @ 5500 MHz; ConvF(4.91, 4.91) @ 5600 MHz; ConvF(5.5, 5.5) @ 5800 MHz; Calibrated: 2022-01-26 - Sensor-Surface: 1.4mm (Mechanical Surface Detection) - Electronics: DA84 Sn1556; Calibrated: 2022-01-12 - Phantom: MPF-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=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0; Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Reference Value = 60.80 V/m; Power Drift = -0.06 dB Peak SAR (extrapolated) = 6.80 W/kg SAR(1 g) = 7.73 W/kg; SAR(10 g) = 2.22 W/kg Smallest distance from peaks to all points 3 dB below = 7.2 mm Ratio of SAR at M2 to SAR at M1 = 66.8% Maximum value of SAR (measured) = 19.3 W/kg Dipole Calibration /Pin=100mW, d=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0; Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Reference Value = 61.08 V/m; Power Drift = -0.07 dB Peak SAR (extrapolated) = 31.5 W/kg SAR(1 g) = 7.94 W/kg; SAR(10 g) = 2.27 W/kg Smallest distance from peaks to all points 3 dB below = 7.2 mm Ratio of SAR at M2 to SAR at M1 = 65.5% Maximum value of SAR (measured) = 19.0 W/kg Certificate No: Z22-60187 Page 2 of 6
In Collaboration with TTL speaq CALIBRATION LABORATORY CAICT Address: No.52 Huayuan Road, Haidian District, Beijing, 100191, China Tel: +86-10-62302117 E-mail: cti@speaq.com http://www.speaq.com Dipole Calibration /Pin=100mW, d=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0; Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Reference Value = 61.92 V/m; Power Drift = -0.08 dB Peak SAR (extrapolated) = 34.7 W/kg SAR(1 g) = 8.28 W/kg; SAR(10 g) = 2.34 W/kg Smallest distance from peaks to all points 3 dB below = 7.2 mm Ratio of SAR at M2 to SAR at M1 = 63.9% Maximum value of SAR (measured) = 20.2 W/kg Dipole Calibration /Pin=100mW, d=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0; Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Reference Value = 65.08 V/m; Power Drift = -0.07 dB Peak SAR (extrapolated) = 35.3 W/kg SAR(1 g) = 8.12 W/kg; SAR(10 g) = 2.3 W/kg Smallest distance from peaks to all points 3 dB below = 7.2 mm Ratio of SAR at M2 to SAR at M1 = 62.5% Maximum value of SAR (measured) = 19.1 W/kg Dipole Calibration /Pin=100mW, d=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0; Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Reference Value = 62.13 V/m; Power Drift = -0.06 dB Peak SAR (extrapolated) = 34.8 W/kg SAR(1 g) = 7.71 W/kg; SAR(10 g) = 2.16 W/kg Smallest distance from peaks to all points 3 dB below = 7.2 mm Ratio of SAR at M2 to SAR at M1 = 61.6% Maximum value of SAR (measured) = 18.7 W/kg  Certificate No: Z22-60187 Page 3 of 6	In Collaboration with TTL speaq CALIBRATION LABORATORY CAICT Address: No.52 Huayuan Road, Haidian District, Beijing, 100191, China Tel: +86-10-62302117 E-mail: cti@speaq.com http://www.speaq.com Impedance Measurement Plot for Head TSL  Certificate No: Z22-60187 Page 4 of 6



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2 DAE4 - SN 1245

Schmid & Partner Engineering AG Zugzwangstrasse 43, 8004 Zurich, Switzerland Phone +41 (0)43 9702, Fax +41 (0)43 9775 www.speag.ch, info@speag.ch s p e a g IMPORTANT NOTICE USAGE OF THE DAE4 The DAE4 unit is a delicate, high precision instrument and requires careful treatment by the user. There are no serviceable parts inside the DAE4. Special attention shall be given to the following points: Battery Exchange: The battery cover of the DAE4 unit is fixed using a screw; over tightening the screw may cause the threads inside the DAE4 to wear out. Shipping of the DAE4: Before shipping the DAE4 to SPEAG for calibration, remove the batteries and pack the DAE4 in an anti-static bag. This anti-static bag shall then be packed into a larger box or container which protects the DAE4 from impacts during transportation. The package shall be marked to indicate that a fragile instrument is inside. E-Stop Failures: Touch detection may be malfunctioning due to broken magnets in the E-stop. Rough handling of the E-stop may lead to damage of these magnets. Touch and collision errors are often caused by dust and dirt accumulated in the E-stop. To prevent E-stop failure, the customer shall always mount the probe to the DAE4 carefully and keep the DAE4 unit in a non-dusty environment if not used for measurements. Repair: Minor repairs are performed at no extra cost during the annual calibration. However, SPEAG reserves the right to charge for any repair especially if rough unprofessional handling caused the defect. DASY Configuration Files: Since the exact values of the DAE4 input resistances, as measured during the calibration procedure of a DAE4 unit, are not used by the DASY software, a nominal value of 200 MOhm is given in the corresponding configuration file. Important Note: Warning and calibration is void if the DAE4 unit is disassembled partly or fully by the Customer. Important Note: Never attempt to grease or oil the E-stop assembly. Cleaning and readjusting of the E-stop assembly is allowed by certified SPEAG personnel only and is part of the annual calibration procedure. Important Note: To prevent damage of the DAE4 probe connector pins, use great care when installing the probe to the DAE4. Carefully connect the probe with the connector notch oriented in the mating position. Avoid any rotational movement of the probe body versus the DAE4 while turning the locking nut of the connector. The same care shall be used when disconnecting the probe from the DAE4. TN_EH190326AE_DAE4.docx 07.03.2019	Calibration Laboratory of Schmid & Partner Engineering AG Zugzwangstrasse 43, 8004 Zurich, Switzerland 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 Client: SGS-CN (Auden) Certificate No.: DAE4-1245_May22 Accreditation No.: SCS 0108 CALIBRATION CERTIFICATE Object: DAE4 - SD 000 D04 BM - SN: 1245 Calibration procedure(s): QA CAL-06 v30 Calibration procedure for the data acquisition electronics (DAE) Calibration date: May 30, 2022 This calibration certificate documents the traceability to national standards, which include the physical units of measurement (SI). The measurement 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 ± 1) °C and humidity < 70%. Calibration Equipment used (MATE critical for calibration) <table border="1"><thead><tr><th>Primary Standards</th><th>ID #</th><th>Due Date (Certificate No.)</th><th>Scheduled Calibration</th></tr></thead><tbody><tr><td>Kathrein Multimeter Type 2001</td><td>SN: 0810278</td><td>31-Aug-21 (No: 31368)</td><td>Aug-22</td></tr></tbody></table> <table border="1"><thead><tr><th>Secondary Standards</th><th>ID #</th><th>Check Date (in hours)</th><th>Scheduled Check</th></tr></thead><tbody><tr><td>Auto DAE Calibration Unit</td><td>SE LWS 05A AA 1001</td><td>24-Jan-22 (in hours check)</td><td>In house check: Jan-22</td></tr><tr><td>Calibrator New V2.1</td><td>SE LWS 00B AA 1002</td><td>24-Jan-22 (in hours check)</td><td>In house check: Jan-22</td></tr></tbody></table> Calibrated by: Dominique Stiller Function: Laboratory Technician Signature: <i>[Signature]</i> Approved by: (Ben Kuhn) Technical Manager: <i>[Signature]</i> This calibration certificate shall not be reproduced except in full without written approval of the laboratory. Certificate No.: DAE4-1245_May22 Page 1 of 5	Primary Standards	ID #	Due Date (Certificate No.)	Scheduled Calibration	Kathrein Multimeter Type 2001	SN: 0810278	31-Aug-21 (No: 31368)	Aug-22	Secondary Standards	ID #	Check Date (in hours)	Scheduled Check	Auto DAE Calibration Unit	SE LWS 05A AA 1001	24-Jan-22 (in hours check)	In house check: Jan-22	Calibrator New V2.1	SE LWS 00B AA 1002	24-Jan-22 (in hours check)	In house check: Jan-22
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Calibration Laboratory of Schmid & Partner Engineering AG Zugzwangstrasse 43, 8004 Zurich, Switzerland Accredited by the Swiss Accreditation Service (SAS) The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates Accreditation No.: SCS 0108 Glossary DAE: data acquisition electronics Connector angle: information used in DASY system to align probe sensor X to the robot coordinate system. Methods Applied and Interpretation of Parameters • DC Voltage Measurement: Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range. • Connector angle: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required. • The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty. • DC Voltage Measurement Linearity: Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement. • Common mode sensitivity: Influence of a positive or negative common mode voltage on the differential measurement. • Channel separation: Influence of a voltage on the neighbor channels not subject to an input voltage. • AD Converter Values with inputs shorted: Values on the internal AD converter corresponding to zero input voltage. • Input Offset Measurement: Output voltage and statistical results over a large number of zero voltage measurements. • Input Offset Current: Typical value for information; Maximum channel input offset current, not considering the input resistance. • Input resistance: Typical value for information; DAE input resistance at the connector, during internal auto-zeroing and during measurement. • Low Battery Alarm Voltage: Typical value for information. Below this voltage, a battery alarm signal is generated. • Power consumption: Typical value for information. Supply currents in various operating modes. Certificate No.: DAE4-1245_May22 Page 2 of 5	DC Voltage Measurement AD - Converter Resolution nominal High Range: 1LSB = 6.1 μV, full range = -190...+320 mV Low Range: 1LSB = 61 μV, full range = -1...+3 mV DASY measurement parameters: Auto Zero-Time: 3 sec; Measuring time: 3 sec <table border="1"><thead><tr><th>Calibration Factors</th><th>X</th><th>Y</th><th>Z</th></tr></thead><tbody><tr><td>High Range</td><td>405.265 ± 0.02% (k=2)</td><td>403.974 ± 0.02% (k=2)</td><td>406.092 ± 0.02% (k=2)</td></tr><tr><td>Low Range</td><td>3.99534 ± 1.50% (k=2)</td><td>3.99508 ± 1.50% (k=2)</td><td>4.01015 ± 1.50% (k=2)</td></tr></tbody></table> Connector Angle <table border="1"><thead><tr><th>Connector Angle to be used in DASY system</th><th>30.0° ± 1°</th></tr></thead></table> Certificate No.: DAE4-1245_May22 Page 3 of 5	Calibration Factors	X	Y	Z	High Range	405.265 ± 0.02% (k=2)	403.974 ± 0.02% (k=2)	406.092 ± 0.02% (k=2)	Low Range	3.99534 ± 1.50% (k=2)	3.99508 ± 1.50% (k=2)	4.01015 ± 1.50% (k=2)	Connector Angle to be used in DASY system	30.0° ± 1°						
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Appendix (Additional assessments outside the scope of SCS0108)

1. DC Voltage Linearity

High Range	Reading (µV)	Difference (µV)	Error (%)
Channel X + Input	19994.45	1.52	0.00
Channel X - Input	20004.58	2.22	0.01
Channel X + Input	-20000.14	1.12	-0.01
Channel Y + Input	19994.72	1.58	0.00
Channel Y - Input	20001.22	-1.00	-0.00
Channel Y + Input	-20003.05	-1.57	0.01
Channel Z + Input	19992.44	0.19	0.00
Channel Z - Input	20003.09	0.58	0.00
Channel Z + Input	-20001.73	-0.27	0.00

Low Range	Reading (µV)	Difference (µV)	Error (%)
Channel X + Input	2001.91	0.41	0.22
Channel X - Input	2002.54	0.65	0.32
Channel X + Input	-197.86	0.07	-0.04
Channel Y + Input	2002.05	0.58	0.03
Channel Y - Input	201.27	-0.57	-0.28
Channel Y + Input	-199.23	-0.06	0.03
Channel Z + Input	2001.98	0.08	0.00
Channel Z - Input	200.09	-1.03	-0.76
Channel Z + Input	-199.85	-1.57	0.79

2. Common mode sensitivity

Common mode Input Voltage (mV)	High Range Average Reading (µV)	Low Range Average Reading (µV)
Channel X 200	-5.87	-7.69
-200	9.12	7.79
Channel Y 200	-8.68	-9.28
-200	8.52	6.36
Channel Z 200	-5.36	-5.60
-200	3.58	3.08

3. Channel separation

Input Voltage (mV)	Channel X (µV)	Channel Y (µV)	Channel Z (µV)
Channel X 200	-	4.07	-3.14
Channel Y 200	9.36	-	4.27
Channel Z 200	10.11	7.14	-

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4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	15984	17040
Channel Y	16562	16768
Channel Z	16035	15968

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Input 10MΩ	Average (µV)	min. Offset (µV)	max. Offset (µV)	Std. Deviation (µV)
Channel X	1.00	-0.15	1.93	0.45
Channel Y	-0.18	-1.28	0.94	0.45
Channel Z	-0.58	-2.81	0.58	0.60

6. Input Offset Current

Nominal input circuitry offset current on all channels: <25nA

7. Input Resistance (Typical values for information)

	Zeroing (ΩOff)	Measuring (ΩChn)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+8	+14
Supply (- Vcc)	-0.01	-8	-9

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3 EX3DV4 - SN 7346

Calibration Laboratory of Schmid & Partner Engineering AG Zugstrasse 6, 8400 Zug, Switzerland 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 Client: Auden Certificate No: EX3-7346_Mar22 CALIBRATION CERTIFICATE Object: EX3DV4 - SN 7346 Customer procedure: QA CAL-01-VL, QA CAL-14-VL, QA CAL-23-V5, QA CAL-25-V7 Calibration procedure for domestic E-field probes Calibration date: March 30, 2022 This calibration certificate documents the traceability to national standards, which implies the physical units of measurement (SI). The measurement 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, environmental temperature (22 ± 0.5 °C) and humidity < 70%. 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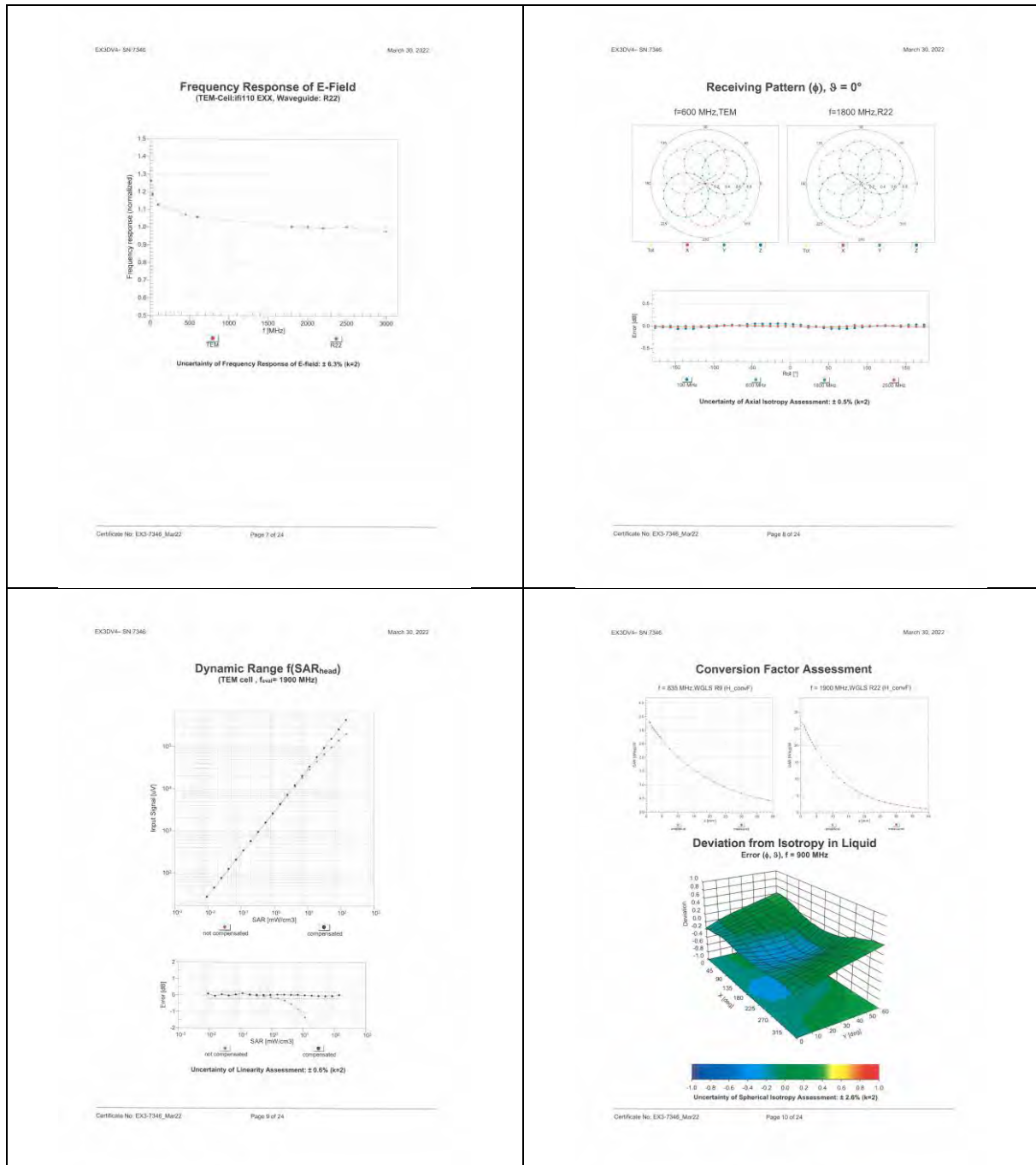
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10414	AAA	WLAN CDFP 64-QAM, 4096Q	Generic	8.54	± 0.6 %		
10415	AAA	IEEE 802.11b WFI 2.4 GHz (DSSS, 1 Mbps, R90c-d)	WLAN	1.54	± 0.6 %		
10416	AAA	IEEE 802.11g WFI 2.4 GHz (DSSS-OFDM, 5.5 Mbps, R90c-d)	WLAN	8.23	± 0.6 %		
10417	AAC	IEEE 802.11a WFI 5 GHz (OFDM, 4 Mbps, R90c-d)	WLAN	8.23	± 0.6 %		
10418	AAA	IEEE 802.11g WFI 2.4 GHz (DSSS-OFDM, 5.5 Mbps, R90c-d)	WLAN	8.14	± 0.6 %		
10419	AAA	IEEE 802.11g WFI 2.4 GHz (DSSS-OFDM, 5.5 Mbps, R90c-d)	WLAN	8.19	± 0.6 %		
10420	AAC	IEEE 802.11n HT Overhead, 7.2 Mbps, R90c-d	WLAN	8.32	± 0.6 %		
10421	AAC	IEEE 802.11n HT Overhead, 4.3 Mbps, 16-QAM, UL Sub	WLAN	8.1	± 0.6 %		
10424	AAA	IEEE 802.11n HT Overhead, 7.2 Mbps, 64-QAM, UL Sub	WLAN	8.40	± 0.6 %		
10425	AAC	IEEE 802.11n HT Overhead, 14 Mbps, R90c-d	WLAN	8.41	± 0.6 %		
10428	AAC	IEEE 802.11n HT Overhead, 30 Mbps, 16-QAM, UL Sub	WLAN	8.45	± 0.6 %		
10427	AAC	IEEE 802.11n HT Overhead, 18 Mbps, 64-QAM, UL Sub	WLAN	8.41	± 0.6 %		
10430	AAD	LTE-FDD OFDMA, 5 MHz, E-UTRA 1.1, Clipping 44%	LTE-FDD	8.28	± 0.6 %		
10431	AAD	LTE-FDD OFDMA, 10 MHz, E-UTRA 1.1, Clipping 44%	LTE-FDD	8.38	± 0.6 %		
10432	AAC	LTE-FDD OFDMA, 15 MHz, E-UTRA 1.1, Clipping 44%	LTE-FDD	8.34	± 0.6 %		
10433	AAC	LTE-FDD OFDMA, 20 MHz, E-UTRA 1.1, Clipping 44%	LTE-FDD	8.34	± 0.6 %		
10434	AAA	W-CDMA (BS Test Mode), 1.6 DPH, Clipping 44%	WCDMA	8.60	± 0.6 %		
10435	AAF	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, QPSK, UL Sub)	LTE-TDD	7.82	± 0.6 %		
10436	AAF	LTE-TDD (SC-FDMA, 1.8 MHz, 1.4 MHz, 16-QAM, UL Sub)	LTE-TDD	7.86	± 0.6 %		
10440	AAD	LTE-FDD OFDMA, 10 MHz, E-UTRA 1.1, Clipping 44%	LTE-FDD	7.91	± 0.6 %		
10449	AAC	LTE-FDD OFDMA, 15 MHz, E-UTRA 1.1, Clipping 44%	LTE-FDD	7.91	± 0.6 %		
10450	AAC	LTE-FDD OFDMA, 20 MHz, E-UTRA 1.1, Clipping 44%	LTE-FDD	7.98	± 0.6 %		
10451	AAA	W-CDMA (BS Test Mode), 1.6 DPH, Clipping 44%	WCDMA	7.99	± 0.6 %		
10452	AAD	Validation (Spurs, 10ms, 10ms)	Test	19.90	± 0.6 %		
10456	AAC	IEEE 802.11ac WFI (160MHz, 64-QAM, R90c-d)	WLAN	8.63	± 0.6 %		
10457	AAA	UMTS FDD (DC-HSPA)	WCDMA	6.62	± 0.6 %		
10458	AAA	CDMA2000 (1xEV-DO, Rev. 3, 3.1MHz)	CDMA2000	6.55	± 0.6 %		
10459	AAA	CDMA2000 (1xEV-DO, Rev. 3, 3.1MHz)	CDMA2000	6.25	± 0.6 %		
10460	AAA	UMTS FDD (DC-HSPA)	WCDMA	2.39	± 0.6 %		
10461	AAB	LTE-TDD (SC-FDMA, 1.8 MHz, 1.4 MHz, QPSK, UL Sub)	LTE-TDD	7.82	± 0.6 %		
10462	AAB	LTE-TDD (SC-FDMA, 1.8 MHz, 1.4 MHz, 16-QAM, UL Sub)	LTE-TDD	8.30	± 0.6 %		
10463	AAB	LTE-TDD (SC-FDMA, 1.8 MHz, 1.4 MHz, 64-QAM, UL Sub)	LTE-TDD	8.30	± 0.6 %		
10464	AAC	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, QPSK, UL Sub)	LTE-TDD	7.82	± 0.6 %		
10465	AAC	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, 16-QAM, UL Sub)	LTE-TDD	8.32	± 0.6 %		
10466	AAC	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, 64-QAM, UL Sub)	LTE-TDD	8.32	± 0.6 %		
10467	AAF	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, QPSK, UL Sub)	LTE-TDD	7.82	± 0.6 %		
10468	AAF	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, 16-QAM, UL Sub)	LTE-TDD	8.32	± 0.6 %		
10469	AAF	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, 64-QAM, UL Sub)	LTE-TDD	8.32	± 0.6 %		
10470	AAF	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, QPSK, UL Sub)	LTE-TDD	7.82	± 0.6 %		
10471	AAF	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, 16-QAM, UL Sub)	LTE-TDD	8.32	± 0.6 %		
10472	AAF	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, 64-QAM, UL Sub)	LTE-TDD	8.32	± 0.6 %		
10473	AAB	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, QPSK, UL Sub)	LTE-TDD	7.82	± 0.6 %		
10474	AAB	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, 16-QAM, UL Sub)	LTE-TDD	8.32	± 0.6 %		
10475	AAB	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, 64-QAM, UL Sub)	LTE-TDD	8.32	± 0.6 %		
10476	AAF	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, QPSK, UL Sub)	LTE-TDD	7.82	± 0.6 %		
10477	AAF	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, 16-QAM, UL Sub)	LTE-TDD	8.32	± 0.6 %		
10478	AAF	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, 64-QAM, UL Sub)	LTE-TDD	8.32	± 0.6 %		
10479	AAB	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, QPSK, UL Sub)	LTE-TDD	7.74	± 0.6 %		
10480	AAB	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, 16-QAM, UL Sub)	LTE-TDD	8.32	± 0.6 %		
10481	AAB	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, 64-QAM, UL Sub)	LTE-TDD	8.45	± 0.6 %		
10482	AAC	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, QPSK, UL Sub)	LTE-TDD	7.71	± 0.6 %		
10483	AAC	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, 16-QAM, UL Sub)	LTE-TDD	8.39	± 0.6 %		
10484	AAC	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, 64-QAM, UL Sub)	LTE-TDD	8.47	± 0.6 %		
10485	AAF	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, QPSK, UL Sub)	LTE-TDD	7.89	± 0.6 %		
10486	AAF	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, 16-QAM, UL Sub)	LTE-TDD	8.38	± 0.6 %		
10487	AAF	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, 64-QAM, UL Sub)	LTE-TDD	8.60	± 0.6 %		
10488	AAF	LTE-TDD (SC-FDMA, 1.8 MHz, 30 MHz, QPSK, UL Sub)	LTE-TDD	7.70	± 0.6 %		
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10489	AAF	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.49	± 0.6 %		
10490	AAC	IEEE 802.11ac WFI (20MHz, MCS1, R90c-d)	WLAN	8.37	± 0.6 %		
10491	AAC	IEEE 802.11ac WFI (20MHz, MCS1, R90c-d)	WLAN	8.39	± 0.6 %		
10492	AAC	IEEE 802.11ac WFI (20MHz, MCS1, R90c-d)	WLAN	8.30	± 0.6 %		
10493	AAC	IEEE 802.11ac WFI (20MHz, MCS1, R90c-d)	WLAN	8.42	± 0.6 %		
10494	AAC	IEEE 802.11ac WFI (20MHz, MCS1, R90c-d)	WLAN	8.42	± 0.6 %		
10495	AAC	IEEE 802.11ac WFI (20MHz, MCS1, R90c-d)	WLAN	8.48	± 0.6 %		
10496	AAD	IEEE 802.11ac WFI (160MHz, MCS0, R90c-d)	WLAN	6.48	± 0.6 %		
10499	AAD	IEEE 802.11ac WFI (160MHz, MCS1, R90c-d)	WLAN	6.47	± 0.6 %		
10500	AAD	IEEE 802.11ac WFI (160MHz, MCS1, R90c-d)	WLAN	6.50	± 0.6 %		
10507	AAD	IEEE 802.11ac WFI (160MHz, MCS1, R90c-d)	WLAN	6.52	± 0.6 %		
10508	AAD	IEEE 802.11ac WFI (160MHz, MCS1, R90c-d)	WLAN	6.61	± 0.6 %		
10509	AAD	IEEE 802.11ac WFI (160MHz, MCS1, R90c-d)	WLAN	6.73	± 0.6 %		
10510	AAD	IEEE 802.11ac WFI (160MHz, MCS1, R90c-d)	WLAN	6.56	± 0.6 %		
10512	AAA	IEEE 802.11g WFI 2.4 GHz (DSSS, 5.5 Mbps, R90c-d)	WLAN	8.23	± 0.6 %		
10513	AAA	IEEE 802.11g WFI 2.4 GHz (DSSS, 11 Mbps, R90c-d)	WLAN	8.23	± 0.6 %		
10514	AAA	IEEE 802.11g WFI 2.4 GHz (DSSS, 11 Mbps, R90c-d)	WLAN	8.14	± 0.6 %		
10515	AAA	IEEE 802.11g WFI 2.4 GHz (DSSS, 5.5 Mbps, R90c-d)	WLAN	8.19	± 0.6 %		
10516	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.32	± 0.6 %		
10517	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.1	± 0.6 %		
10518	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.40	± 0.6 %		
10519	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.41	± 0.6 %		
10520	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.45	± 0.6 %		
10521	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.41	± 0.6 %		
10522	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.45	± 0.6 %		
10523	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.41	± 0.6 %		
10524	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.45	± 0.6 %		
10525	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.41	± 0.6 %		
10526	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.45	± 0.6 %		
10527	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.41	± 0.6 %		
10528	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.45	± 0.6 %		
10529	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.41	± 0.6 %		
10530	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.45	± 0.6 %		
10531	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.41	± 0.6 %		
10532	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.45	± 0.6 %		
10533	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.41	± 0.6 %		
10534	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.45	± 0.6 %		
10535	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.41	± 0.6 %		
10536	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.45	± 0.6 %		
10537	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.41	± 0.6 %		
10538	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.45	± 0.6 %		
10539	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.41	± 0.6 %		
10540	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.45	± 0.6 %		
10541	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.41	± 0.6 %		
10542	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.45	± 0.6 %		
10543	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.41	± 0.6 %		
10544	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.45	± 0.6 %		
10545	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.41	± 0.6 %		
10546	AAC	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.45	± 0.6 %		
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EX3044-SN-7346				March 30, 2022			
10547	AAF	IEEE 802.11n HT WFI (60MHz, MCS1, R90c-d)	WLAN	8.49	± 0.6 %		
10548	AAC	IEEE 802.11ac WFI (20MHz, MCS1, R90c-d)	WLAN	8.37	± 0.6 %		
10549	AAC	IEEE 802.11ac WFI (20MHz, MCS1, R90c-d)	WLAN	8.39	± 0.6 %		
10550	AAC	IEEE 802.11ac WFI (20MHz, MCS1, R90c-d)	WLAN	8.30	± 0.6 %		
10551	AAC	IEEE 802.11ac WFI (20MHz, MCS1, R90c-d)	WLAN	8.42	± 0.6 %		
10552	AAC	IEEE 802.11ac WFI (20MHz, MCS1, R90c-d)	WLAN	8.42	± 0.6 %		
10553	AAC	IEEE 802.11ac WFI (20MHz, MCS1, R90c-d)	WLAN	8.48	± 0.6 %		
10554	AAD	IEEE 802.11ac WFI (160MHz, MCS0, R90c-d)	WLAN	6.48	± 0.6 %		
10555	AAD	IEEE 802.11ac WFI (160MHz, MCS1, R90c-d)	WLAN	6.47	± 0.6 %		
10556	AAD	IEEE 802.11ac WFI (160MHz, MCS1, R90c-d)	WLAN	6.50	± 0.6 %		
10557	AAD	IEEE 802.11ac WFI (160MHz, MCS1, R90c-d)	WLAN	6.52	± 0.6 %		
10558	AAD	IEEE 802.11ac WFI (160MHz, MCS1, R90c-d)	WLAN	6.61	± 0.6 %		
10559	AAD	IEEE 802.11ac WFI (160MHz, MCS1, R90c-d)	WLAN	6.73	± 0.6 %		
10560	AAD	IEEE 802.11ac WFI (160MHz, MCS1, R90c-d)	WLAN	6.56	± 0.6 %		
10562	AAD	IEEE 802.11ac WFI (160MHz, MCS1, R90c-d)	WLAN	6.69	± 0.6 %		
10563	AAD	IEEE 802.11ac WFI (160MHz, MCS1, R90c-d)	WLAN	6.77	± 0.6 %		
10564	AAA	IEEE 802.11g WFI 2.4 GHz (DSSS-OFDM, 5.5 Mbps, R90c-d)	WLAN	8.23	± 0.6 %		
10565	AAA	IEEE 802.11g WFI 2.4 GHz (DSSS-OFDM, 12 Mbps, R90c-d)	WLAN	8.45	± 0.6 %		
10566	AAA	IEEE 802.11g WFI 2.4 GHz (DSSS-OFDM, 18 Mbps, R90c,					

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EXC304--SN 7346 March 30, 2022 15985 AAA 50 NR DL (CP-CFOM, TM 3.1, 40 MHz, 64-QAM, 30 kHz) SG NR PR1 TDD 9.54 ± 9.8 % 15986 AAA 50 NR DL (CP-CFOM, TM 3.1, 50 MHz, 64-QAM, 30 kHz) SG NR PR1 TDD 9.50 ± 9.8 % 15987 AAA 50 NR DL (CP-CFOM, TM 3.1, 60 MHz, 64-QAM, 30 kHz) SG NR PR1 TDD 9.50 ± 9.8 % 15988 AAA 50 NR DL (CP-CFOM, TM 3.1, 70 MHz, 64-QAM, 30 kHz) SG NR PR1 TDD 9.38 ± 9.8 % 15989 AAA 50 NR DL (CP-CFOM, TM 3.1, 80 MHz, 64-QAM, 30 kHz) SG NR PR1 TDD 9.33 ± 9.8 % 15990 AAA 50 NR DL (CP-CFOM, TM 3.1, 90 MHz, 64-QAM, 30 kHz) SG NR PR1 TDD 9.52 ± 9.8 % ¹ Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the test value. Certificate No. EXC3-7346_Mar22 Page 24 of 24	EXC304--SN 7346 March 30, 2022 15985 AAA 50 NR DL (CP-CFOM, TM 3.1, 40 MHz, 64-QAM, 30 kHz) SG NR PR1 TDD 9.54 ± 9.8 % 15986 AAA 50 NR DL (CP-CFOM, TM 3.1, 50 MHz, 64-QAM, 30 kHz) SG NR PR1 TDD 9.50 ± 9.8 % 15987 AAA 50 NR DL (CP-CFOM, TM 3.1, 60 MHz, 64-QAM, 30 kHz) SG NR PR1 TDD 9.50 ± 9.8 % 15988 AAA 50 NR DL (CP-CFOM, TM 3.1, 70 MHz, 64-QAM, 30 kHz) SG NR PR1 TDD 9.38 ± 9.8 % 15989 AAA 50 NR DL (CP-CFOM, TM 3.1, 80 MHz, 64-QAM, 30 kHz) SG NR PR1 TDD 9.33 ± 9.8 % 15990 AAA 50 NR DL (CP-CFOM, TM 3.1, 90 MHz, 64-QAM, 30 kHz) SG NR PR1 TDD 9.52 ± 9.8 % ¹ Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the test value. Certificate No. EXC3-7346_Mar22 Page 24 of 24
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4 Impedance and return loss

Dipole CLA150 SN 4025				
Head Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	ΔΩ
2021/4/26	-31.4	/	47.8	/
Dipole D450V3 SN 1103				
Head Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	ΔΩ
2021/4/21	-23	/	57.1	/



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