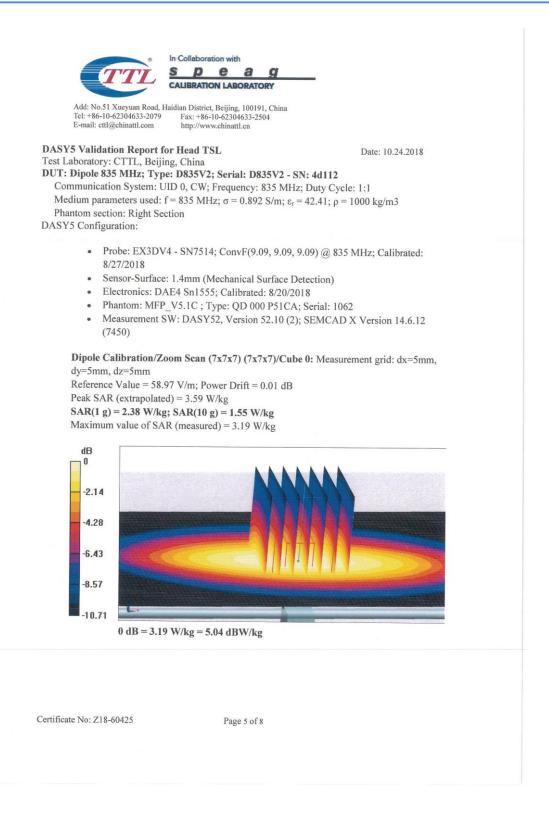


TTT S P	TION LAB	ag	_		
Add: No.51 Xueyuan Road, Haidian Dist Tel: +86-10-62304633-2079 Fax: +1 E-mail: ettl@chinattl.com http://v	rict, Beijing 86-10-62304 www.chinatt	4633-2504			
DASY system configuration, as far as not	t aiven on	nage 1			
DASY Version		DASY52		5	2.10.2.1495
Extrapolation	Advance	ed Extrapolation			
Phantom		at Phantom 5.1C			
Distance Dipole Center - TSL		15 mm			with Craner
Zoom Scan Resolution					with Spacer
	Strong of the	y, dz = 5 mm			
Frequency	835 1	MHz ± 1 MHz			
ead TSL parameters					
The following parameters and calculations	s were ap	olied. Temperature	Permitti	vity	Conductivity
Nominal Head TSL parameters		22.0 °C	41.5	vity	
					0.90 mho/m
Measured Head TSL parameters		22.0 ± 0.2) °C	42.4 ± 0	6 %	0.89 mho/m ± 6 %
Head TSL temperature change during	g test	<1.0 °C			
SAR averaged over 1 cm <sup>3</sup> (1 g) of Her	ad TO	Condi	tion	1	
SAR measured	ad ISL	250 mW in			2.29 mal/// m
					2.38 mW / g
SAR for nominal Head TSL parameters			Condition		nW /g ± 18.8 % (k=2
SAR averaged over 10 cm <sup>3</sup> (10 g) of H	Head TSL			-	
SAR measured		250 mW input power			1.55 mW / g
SAR for nominal Head TSL parameters		normalize	zed to 1W 6.25		nW /g ± 18.7 % (k=2
ody TSL parameters The following parameters and calculations		lied.	Permitti	vitv	Conductivity
Nominal Body TSL parameters		22.0 °C	55.2		0.97 mho/m
Measured Body TSL parameters	(2	2.0 ± 0.2) °C	55.3 ± 6	s %	0.96 mho/m ± 6 %
		,			
Body TSL temperature change during	test	<1.0 °C			
Body TSL temperature change during	j test	<1.0 °C			
		<1.0 °C Condit	ion		
R result with Body TSL					2.42 mW / g
AR result with Body TSL SAR averaged over 1 cm <sup>3</sup> (1 g) of Bod		Condit	out power	9.75 n	
AR result with Body TSL SAR averaged over 1 cm <sup>3</sup> (1 g) of Boo SAR measured	dy TSL	Condit 250 mW inj	out power d to 1W	9.75 n	
AR result with Body TSL SAR averaged over 1 cm <sup>3</sup> (1 g) of Boo SAR measured SAR for nominal Body TSL parameters	dy TSL	Condit 250 mW inj normalizer	out power d to 1W ion	9.75 n	2.42 mW / g nW /g ± 18.8 % (k=2 1.59 mW / g

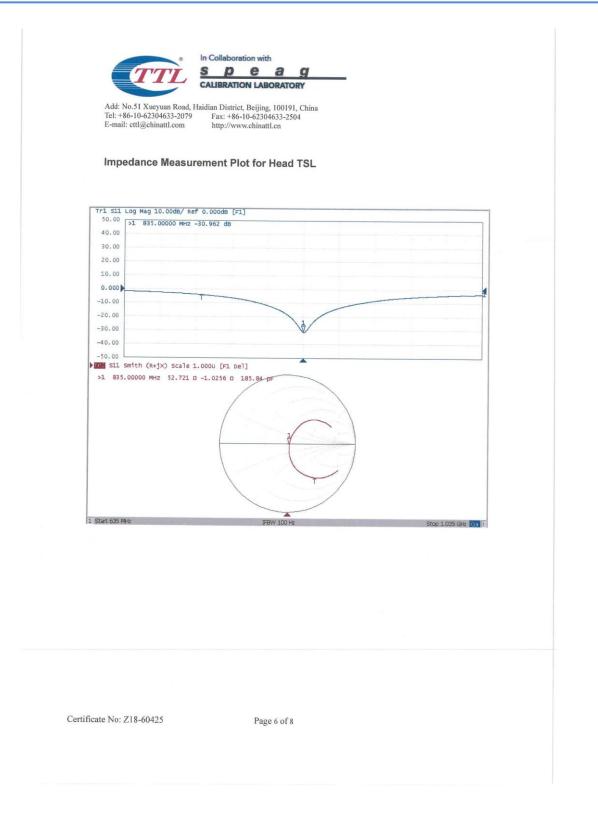


Add: No.51 Xueyuan Road, Haidian Tel: +86-10-62304633-2079 Fr E-mail: ctt@chinattl.com h Appendix (Additional assess Antenna Parameters with He	x::+86-10-62304633-2 tp://www.chinattl.cn sments outside ad TSL	91, China 504
Impedance, transformed to feed po	pint	52.7Ω- 1.03jΩ
Antenna Parameters with Bo	dy TSL	- 31.0dB
Impedance, transformed to feed po	pint	49.2Ω- 6.11jΩ
Return Loss		- 24.1dB
General Antenna Parameters	and Design	1.265 ns
of the dipoles, small end caps are a	dded to the dinole	ha is therefore short-circuited for DC-signals. On some arms in order to improve matching when loaded
of the dipoles, small end caps are a loccording to the position as explain. ffected by this change. The overall lo excessive force must be applied onnections near the feedpoint may	dded to the dipole ed in the "Measure dipole length is st to the dipole arms	arms in order to improve matching when loaded
of the dipoles, small end caps are a according to the position as explain. Affected by this change. The overall to excessive force must be applied connections near the feedpoint may	dded to the dipole ed in the "Measure dipole length is st to the dipole arms	arms in order to improve matching when loaded ement Conditions" paragraph. The SAR data are not ill according to the Standard
of the dipoles, small end caps are a according to the position as explain. affected by this change. The overall No excessive force must be applied connections near the feedpoint may Additional EUT Data	dded to the dipole ed in the "Measure dipole length is st to the dipole arms	arms in order to improve matching when loaded ement Conditions" paragraph. The SAR data are not ill according to the Standard. , because they might bend or the soldered
of the dipoles, small end caps are a according to the position as explain. affected by this change. The overall to excessive force must be applied connections near the feedpoint may Additional EUT Data	dded to the dipole ed in the "Measure dipole length is st to the dipole arms	arms in order to improve matching when loaded ement Conditions" paragraph. The SAR data are not ill according to the Standard. s, because they might bend or the soldered SPEAG

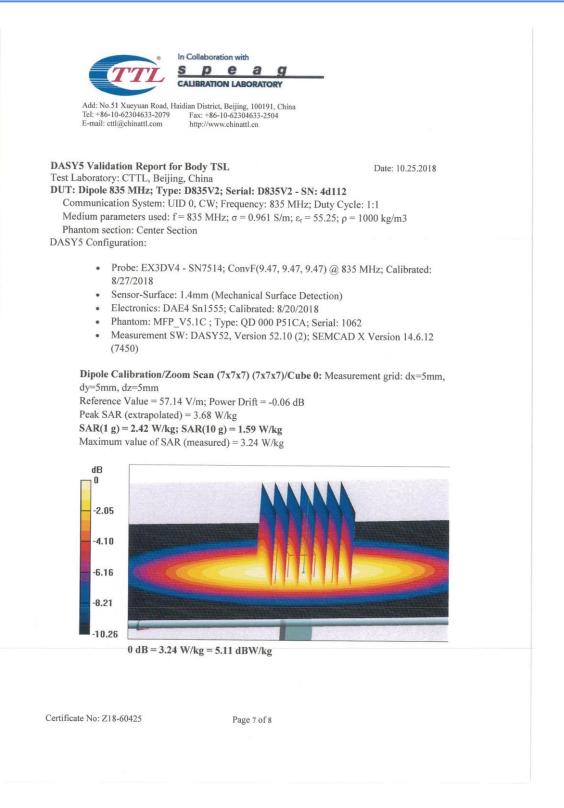




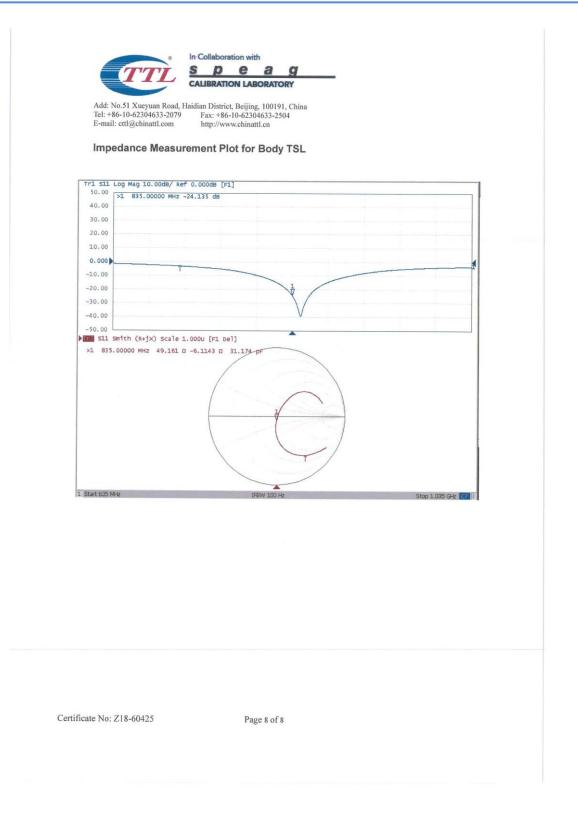














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Tel: +86-10-623046 E-mail: cttl@chinat		86-10-62304633-2504 www.chinattl.cn	adalahat		CNAS L057
Client CTT	L-CQ	C	ertificate No:	Z17-97253	
CALIBRATION CI	ERTIFICAT	E			
Object	5 ( 0 0 0				
Object	D1900	/2 - SN: 5d151			
Calibration Procedure(s)	FE-711	-003-01			
		tion Procedures for dig	ole validation kits		
Collibration data:					
Calibration date:	Decem	ber 6, 2017			
name and are part of the ac	asurements and				
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4	(M&TE critical fo ID # 102196 100596 SN 3617	the closed laboratory or calibration) Cal Date(Calibrated 02-Mar-17 (CTTL, N 02-Mar-17 (CTTL, N 23-Jan-17(SPEAG,N	by, Certificate No. o.J17X01254) o.J17X01254) lo.EX3-3617_Jan1	) Schedule M 7) J	ed Calibration lar-18 lar-18 an-18
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRVD Power sensor NRV-Z5	(M&TE critical for ID # 102196 100596	the closed laboratory or calibration) Cal Date(Calibrated 02-Mar-17 (CTTL, N 02-Mar-17 (CTTL, N	by, Certificate No. o.J17X01254) o.J17X01254) lo.EX3-3617_Jan1	) Schedule M 7) J	ed Calibration lar-18 lar-18
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE3 Secondary Standards	Conducted in (M&TE critical for 102196) 100296 SN 3617 SN 536 ID #	the closed laboratory or calibration) Cal Date(Calibrated 02-Mar-17 (CTTL, N 02-Mar-17 (CTTL, N 23-Jan-17(SPEAG,N 09-Oct-17(CTTL-SP Cal Date(Calibrated	by, Certificate No. o.J17X01254) o.J17X01254) lo.EX3-3617_Jan1 EAG,No.Z17-97198 by, Certificate No.)	) Schedule M 7) J 8) C	ed Calibration lar-18 lar-18 an-18
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Power sensor NRV-Z5 Reference Probe EX3DV4 DAE3 Secondary Standards Signal Generator E4438C	Conducted in (M&TE critical for 102196) 100596 SN 3617 SN 536 ID # MY49071430	the closed laboratory or calibration) Cal Date(Calibrated 02-Mar-17 (CTTL, N 02-Mar-17 (CTTL, N 23-Jan-17(CTTL-SP Cal Date(Calibrated 13-Jan-17 (CTTL, N	by, Certificate No. o.J17X01254) o.J17X01254) lo.EX3-3617_Jan1 EAG,No.Z17-97198 by, Certificate No.) o.J17X00286)	) Schedule M 7) J 8) C Schedule J J	ed Calibration lar-18 lar-18 an-18 Dct-18 ed Calibration an-18
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE3 Secondary Standards Signal Generator E4438C Network Analyzer E5071C	ertificate. conducted in (M&TE critical for 102196 100596 SN 3617 SN 536 ID # MY49071430 MY46110673	the closed laboratory or calibration) Cal Date(Calibrated 02-Mar-17 (CTTL, N 02-Mar-17 (CTTL, N 23-Jan-17 (CTTL-SP Cal Date(Calibrated 13-Jan-17 (CTTL, N 13-Jan-17 (CTTL, N	by, Certificate No. o.J17X01254) o.J17X01254) lo.EX3-3617_Jan1 EAG,No.Z17-97198 by, Certificate No.) o.J17X00286) o.J17X00285)	) Schedule M 7) J 8) C Schedule J J	ed Calibration lar-18 lar-18 an-18 Oct-18 ed Calibration an-18 an-18
All calibrations have been humidity<70%. Calibration Equipment used Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE3 Secondary Standards Signal Generator E4438C	ertificate. conducted in (M&TE critical for 102196 100596 SN 3617 SN 536 ID # MY49071430 MY46110673 Name	the closed laboratory or calibration) Cal Date(Calibrated 02-Mar-17 (CTTL, N 02-Mar-17 (CTTL, N 23-Jan-17 (CTTL-SP Cal Date(Calibrated 13-Jan-17 (CTTL, N 13-Jan-17 (CTTL, N Function	by, Certificate No. o.J17X01254) o.J17X01254) lo.EX3-3617_Jan1 EAG,No.Z17-97198 by, Certificate No.) o.J17X00286) o.J17X00285)	) Schedule M 7) J 8) C Schedule J J	ed Calibration lar-18 lar-18 an-18 Oct-18 ed Calibration an-18 an-18

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#### lossary: TSL ConvF

N/A

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

# Calibration is Performed According to the Following Standards:

- a) 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 assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- d) KDB865664, 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 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	DASY52	52.10.0.1446
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	1900 MHz ± 1 MHz	

# Head TSL parameters

The following parameters and calculations were applied.

Temperature	Permittivity	Conductivity
22.0 °C	40.0	1.40 mho/m
(22.0 ± 0.2) °C	39.4 ± 6 %	1.41 mho/m ± 6 %
<1.0 °C		
	22.0 °C (22.0 ± 0.2) °C	22.0 °C         40.0           (22.0 ± 0.2) °C         39.4 ± 6 %

# SAR result with Head TSL

SAR averaged over 1 $cm^3$ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	40.5 mW /g ± 18.8 % (k=2)
SAR averaged over 10 $cm^3$ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.30 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	21.1 mW /g ± 18.7 % (k=2)

# **Body TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.9 ± 6 %	1.54 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C		

# SAR result with Body TSL

SAR averaged over 1 $cm^3$ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	40.4 mW /g ± 18.8 % (k=2)
SAR averaged over 10 $cm^3$ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.34 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	21.2 mW /g ± 18.7 % (k=2)

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# Appendix (Additional assessments outside the scope of CNAS L0570)

# Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.8Ω+ 5.34jΩ	
Return Loss	- 25.2dB	

# Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.3Ω+ 5.41jΩ	
Return Loss	- 24.8dB	

# General Antenna Parameters and Design

Electrical Delay (one direction)	1.057 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

# Additional EUT Data

Manufactured by	SPEAG
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**DASY5 Validation Report for Head TSL** Test Laboratory: CTTL, Beijing, China

Date: 12.06.2017

# DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d151 Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1 Medium parameters used: f = 1900 MHz; $\sigma = 1.409 \text{ S/m}$ ; $\epsilon r = 39.36$ ; $\rho = 1000 \text{ kg/m3}$ Phantom section: Center Section

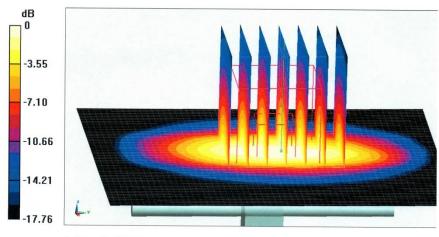
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 SN3617; ConvF(8.26, 8.26, 8.26); Calibrated: 1/23/2017; .
- . Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 10/9/2017 .
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 101.8 V/m; Power Drift = 0.02 dB Peak SAR (extrapolated) = 19.3 W/kg SAR(1 g) = 10.2 W/kg; SAR(10 g) = 5.3 W/kg Maximum value of SAR (measured) = 15.9 W/kg



0 dB = 15.9 W/kg = 12.01 dBW/kg

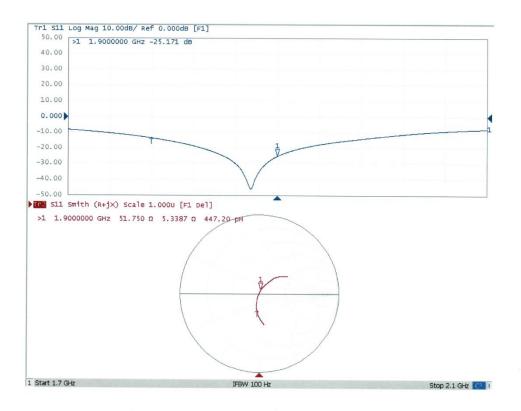
Certificate No: Z17-97253

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# Impedance Measurement Plot for Head TSL



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# **DASY5 Validation Report for Body TSL** Test Laboratory: CTTL, Beijing, China

Date: 12.06.2017

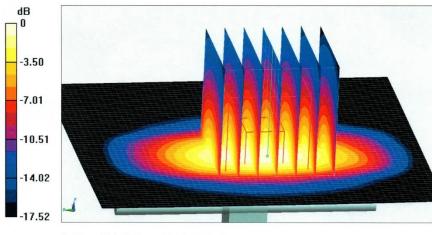
# **DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d151** Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1 Medium parameters used: f = 1900 MHz; $\sigma = 1.542$ S/m; $\varepsilon_r = 52.89$ ; $\rho = 1000$ kg/m<sup>3</sup> Phantom section: Left Section Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 SN3617; ConvF(7.95, 7.95, 7.95); Calibrated: 1/23/2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn536; Calibrated: 10/9/2017
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA; Serial: 1161/1
- Measurement SW: DASY52, Version 52.10 (0); SEMCAD X Version 14.6.10 (7417)

System Performance Check/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm Reference Value = 93.74 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 18.7 W/kg SAR(1 g) = 10.2 W/kg; SAR(10 g) = 5.34 W/kg Maximum value of SAR (measured) = 15.8 W/kg



0 dB = 15.8 W/kg = 11.99 dBW/kg

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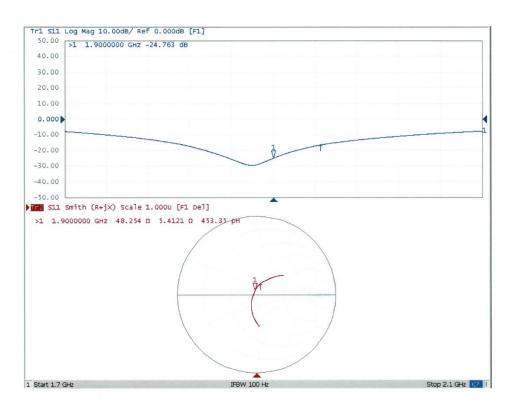


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# Impedance Measurement Plot for Body TSL



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Power sensor NRV-Z5 Reference Probe EX3DV4	ID # 102083 100542 SN 7514	Cal Date(Calibrated b 01-Nov-17 (CTTL, No 01-Nov-17 (CTTL, No 27-Aug-18(SPEAG,No	J17X08756) J17X08756) DEX3-7514_Aug18 DAE4-1555_Aug1	Oc Oc ) Aug	t-18 t-18 g-19 g-19
Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C	ID # 102083 100542 SN 7514 SN 1555 ID # MY49071430	Cal Date(Calibrated b 01-Nov-17 (CTTL, No 01-Nov-17 (CTTL, No 27-Aug-18(SPEAG,No 20-Aug-18(SPEAG,No Cal Date(Calibrated b 23-Jan-18 (CTTL, No.	J17X08756) J17X08756) b.EX3-7514_Aug18 b.DAE4-1555_Aug1 y, Certificate No.) J18X00560)	Oc Oc ) Aug (8) Aug Scheduled Jan	t-18 t-18 g-19 g-19 Calibration i-19
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Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C	ID # 102083 100542 SN 7514 SN 1555 ID # MY49071430 MY46110673	Cal Date(Calibrated b 01-Nov-17 (CTTL, No 01-Nov-17 (CTTL, No 27-Aug-18(SPEAG,No 20-Aug-18(SPEAG,No Cal Date(Calibrated b 23-Jan-18 (CTTL, No. 24-Jan-18 (CTTL, No.	J17X08756) J17X08756) b.EX3-7514_Aug18 b.DAE4-1555_Aug1 y, Certificate No.) J18X00560)	Oc Oc ) Aug 8) Aug Scheduled Jan Jan	t-18 t-18 g-19 g-19 Calibration I-19 I-19
Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C	ID # 102083 100542 SN 7514 SN 1555 ID # MY49071430 MY46110673 Name	Cal Date(Calibrated E 01-Nov-17 (CTTL, No 01-Nov-17 (CTTL, No 27-Aug-18(SPEAG,No 20-Aug-18(SPEAG,No Cal Date(Calibrated by 23-Jan-18 (CTTL, No. 24-Jan-18 (CTTL, No.	J17X08756) J17X08756) DEX3-7514_Aug18 DAE4-1555_Aug1 y, Certificate No.) J18X00560) J18X00561)	Oc Oc ) Aug (8) Aug Scheduled Jan	t-18 t-18 g-19 g-19 Calibration I-19 I-19
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Primary Standards Power Meter NRVD Power sensor NRV-Z5 Reference Probe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzer E5071C Calibrated by: Reviewed by:	ID # 102083 100542 SN 7514 SN 1555 ID # MY49071430 MY46110673 Name Zhao Jing	Cal Date(Calibrated E 01-Nov-17 (CTTL, No 01-Nov-17 (CTTL, No 27-Aug-18(SPEAG,No 20-Aug-18(SPEAG,No Cal Date(Calibrated by 23-Jan-18 (CTTL, No. 24-Jan-18 (CTTL, No. Function SAR Test Engine	J17X08756) J17X08756) DEX3-7514_Aug18 DAE4-1555_Aug1 y, Certificate No.) J18X00560) J18X00561) Der	Oc Oc ) Aug 8) Aug Scheduled Jan Jan	t-18 t-18 g-19 g-19 Calibration i-19 i-19
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#### Glossary:

TSL	
ConvF	
N/A	

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

# Calibration is Performed According to the Following Standards:

- a) 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 assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010 d) KDB865664, 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 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: Z18-60430





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 E-mail: cttl@chinattl.com
 http://www.chinattl.cn

# Measurement Conditions

DASY Version	DASY52	52.10.2.1495
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.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.2 ± 6 %	1.80 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C		

SAR averaged over 1 $cm^3$ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.1 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	52.4 mW /g ± 18.8 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.10 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	24.4 mW /g ± 18.7 % (k=2)

# Body TSL parameters

V. 41.	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.8 ± 6 %	2.01 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C		

# SAR result with Body TSL

SAR averaged over 1 $cm^3$ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.8 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	50.5 mW /g ± 18.8 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	5.92 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	23.5 mW /g ± 18.7 % (k=2)

Certificate No: Z18-60430





# Appendix (Additional assessments outside the scope of CNAS L0570)

# Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.3Ω+ 5.46 jΩ
Return Loss	- 24.7dB

g

#### Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.7Ω+ 7.26 jΩ	
Return Loss	- 22.8dB	

#### General Antenna Parameters and Design

Electrical Delay (one direction)	1.022 ns	
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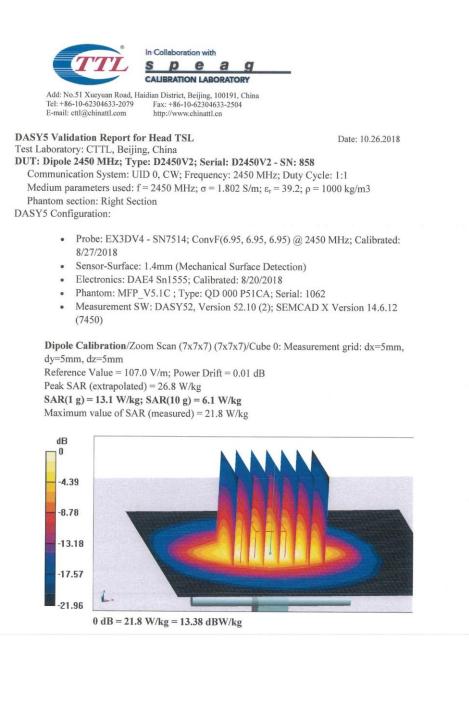
After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly or the dipole of 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

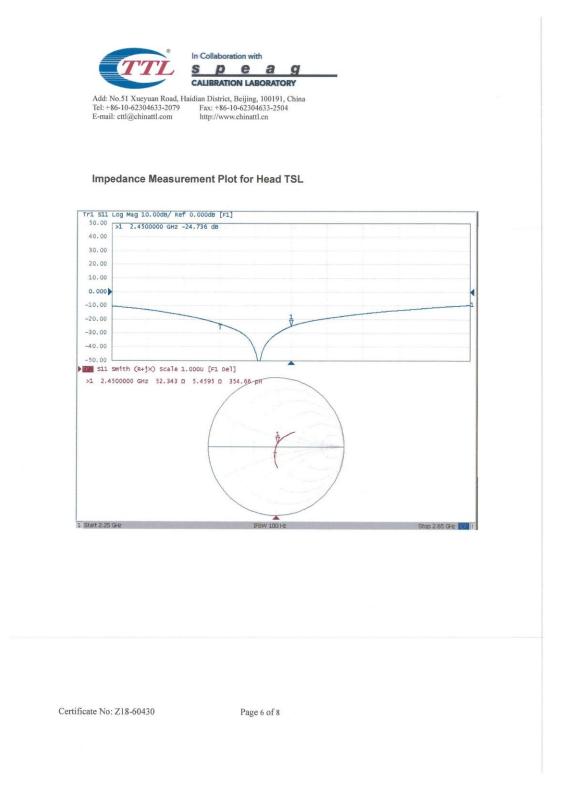
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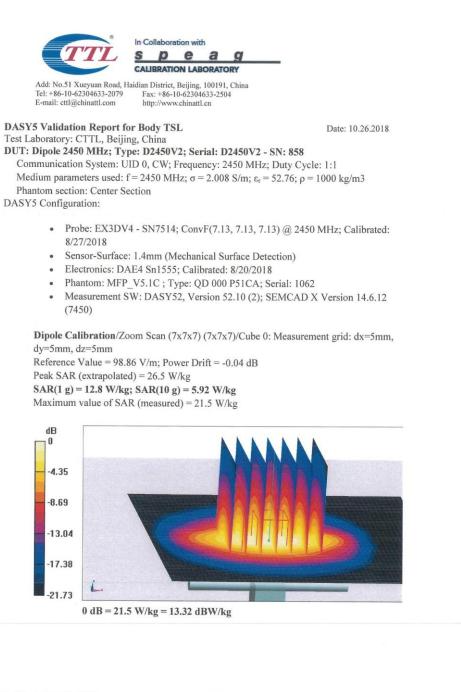


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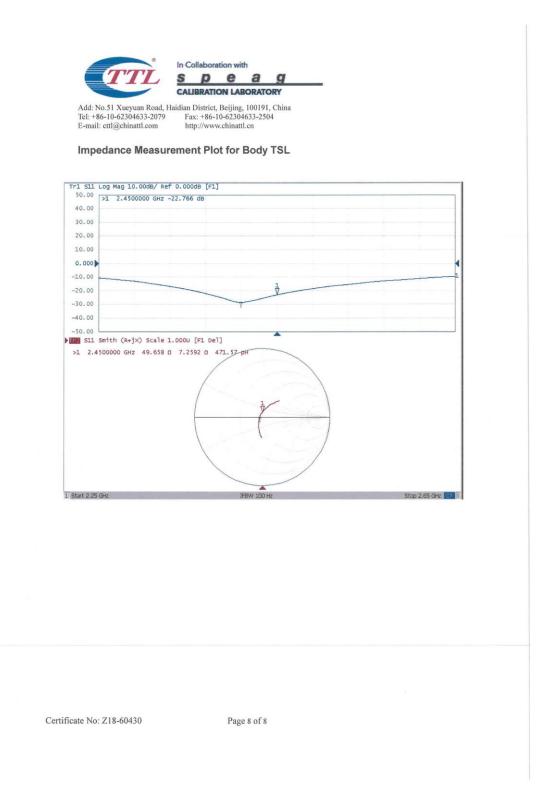






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	CALIBRA	TION LABORATORY	CNAS 国际互认
Add: No.51 Xueyu Tel: +86-10-62304 E-mail: cttl@china	533-2079 Fax: -	strict, Beijing, 100191, China +86-10-62304633-2504 /www.chinattl.cn	CALIBRATIO CNAS L0570
Client ECI1			Z18-60431
CALIBRATION C			
Object	D2600	V2 - SN: 1031	
Calibration Procedure(s)	FF-Z11	1-003-01	
	Calibra	ation Procedures for dipole validation kits	
Calibration date:	Novem	ber 1, 2018	
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TSL

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Glossary: tissue simulating liquid ConvF sensitivity in TSL / NORMx,y,z 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 assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010 d) KDB865664, 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 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: Z18-60431



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# Measurement Conditions

DASY Version	DASY52	52.10.2.1495
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	2600 MHz ± 1 MHz	

Head TSL parameters The following parameters and calculations were applied.

the following parameters and calculations were	applieu.			
	Temperature	Permitt	ivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.0		1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.1 ±	6 %	1.94 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C			
R result with Head TSL				
SAR averaged over 1 $cm^3$ (1 g) of Head TSL	Condi	tion		
SAR measured	250 mW in	put power		14.2 mW / g
SAR for nominal Head TSL parameters	normalize	ed to 1W	57.2	mW /g ± 18.8 % (k=2)
SAR averaged over 10 $cm^3$ (10 g) of Head T	SL Condi	tion		
SAR measured	250 mW in	put power		6.33 mW / g
SAR for nominal Head TSL parameters	normalize	ed to 1W	25.4	mW /g ± 18.7 % (k=2)
The following parameters and calculations were	applied. Temperature	Permitt	vity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.5	,	2.16 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.7 ±	6 %	2.21 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C			
R result with Body TSL		1		
SAR averaged over 1 $cm^3$ (1 g) of Body TSL	. Condi	tion		
SAR measured	250 mW in	put power		13.7 mW / g
SAR for nominal Body TSL parameters	normalize	d to 1W	54.3 1	mW /g ± 18.8 % (k=2)
SAR averaged over 10 $cm^3$ (10 g) of Body T	SL Condit	lion		
SAR measured	250 mW in	put power		6.06 mW / g
SAR for nominal Body TSL parameters	normalize	d to 1W	24.1 1	mW /g ± 18.7 % (k=2)

Certificate No: Z18-60431





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# Appendix(Additional assessments outside the scope of CNAS L0570)

# Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.5Ω- 4.69jΩ
Return Loss	- 26.0dB

# Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.9Ω- 4.36jΩ	
Return Loss	- 25.1dB	

#### General Antenna Parameters and Design

Electrical Delay (one direction)	1.015 ns	
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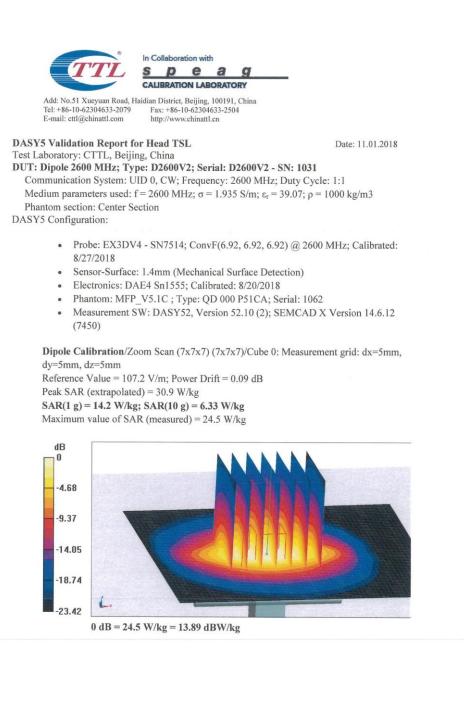
After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard. No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

# Additional EUT Data

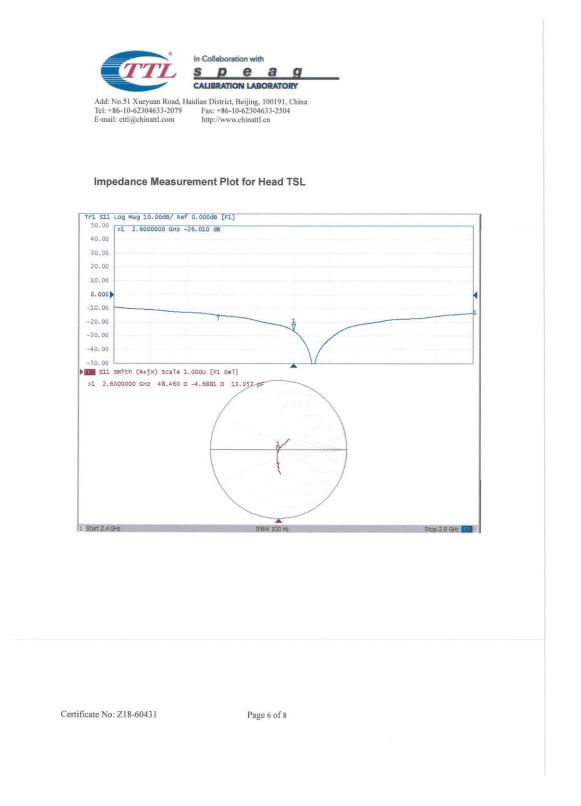
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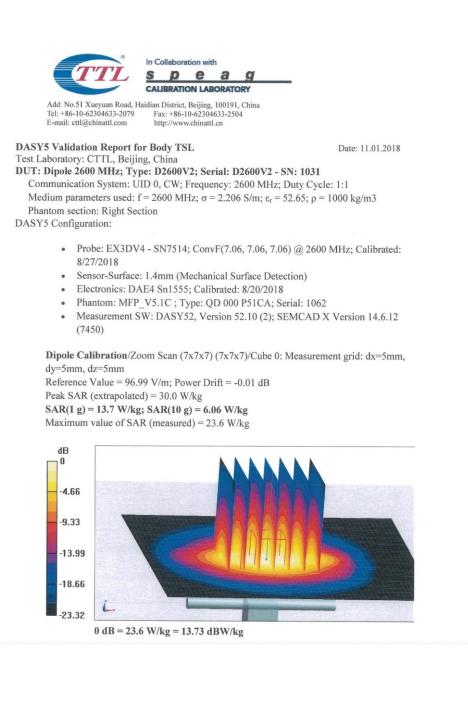


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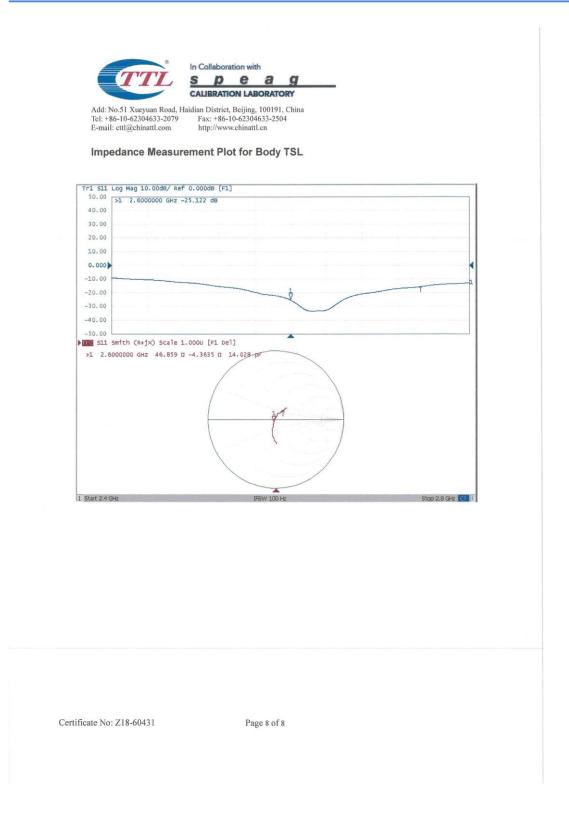






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Client ECI			218-60042
CALIBRATION C	ERTIFICA	IE	
Object	D5GH	zV2 - SN: 1172	
Calibration Procedure(s)		1-003-01 ation Procedures for dipole validation kits	
Calibration date:	March	30, 2018	
measurements(SI). The me pages and are part of the ce	asurements and ertificate.	traceability to national standards, which m the uncertainties with confidence probabilit the closed laboratory facility: environmen	y are given on the following
Calibration Equipment used	I (M&TE critical f	or calibration)	
Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
			Scheduled Calibration
Power Meter NRP2	102083	01-Nov-17 (CTTL, No.J17X08756)	Oct-18
Power sensor NRP-Z91	100542	01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756)	Oct-18 Oct-18
Power sensor NRP-Z91 ReferenceProbe EX3DV4	100542 SN 7464	01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756) 12-Sep-17(SPEAG,No.EX3-7464_Sep17)	Oct-18 Oct-18 Sep-18
Power sensor NRP-Z91	100542	01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756)	Oct-18 Oct-18 Sep-18
Power sensor NRP-Z91 ReferenceProbe EX3DV4	100542 SN 7464	01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756) 12-Sep-17(SPEAG,No.EX3-7464_Sep17)	Oct-18 Oct-18 Sep-18
Power sensor NRP-Z91 ReferenceProbe EX3DV4 DAE4	100542 SN 7464 SN 1525	01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756) 12-Sep-17(SPEAG,No.EX3-7464_Sep17) 02-Oct-17(SPEAG,No.DAE4-1525_Oct17)	Oct-18 Oct-18 Sep-18 ) Oct-18
Power sensor NRP-Z91 ReferenceProbe EX3DV4 DAE4 Secondary Standards	100542 SN 7464 SN 1525 ID #	01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756) 12-Sep-17(SPEAG,No.EX3-7464_Sep17) 02-Oct-17(SPEAG,No.DAE4-1525_Oct17) Cal Date(Calibrated by, Certificate No.)	Oct-18 Oct-18 Sep-18 ) Oct-18 Scheduled Calibration
Power sensor NRP-Z91 ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzerE5071C	100542 SN 7464 SN 1525 ID # MY49071430	01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756) 12-Sep-17(SPEAG,No.EX3-7464_Sep17) 02-Oct-17(SPEAG,No.DAE4-1525_Oct17) Cal Date(Calibrated by, Certificate No.) 23-Jan-18 (CTTL, No.J18X00560)	Oct-18 Oct-18 Sep-18 ) Oct-18 Scheduled Calibration Jan-19
Power sensor NRP-Z91 ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzerE5071C	100542 SN 7464 SN 1525 ID # MY49071430 MY46110673	01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756) 12-Sep-17(SPEAG,No.EX3-7464_Sep17) 02-Oct-17(SPEAG,No.DAE4-1525_Oct17) Cal Date(Calibrated by, Certificate No.) 23-Jan-18 (CTTL, No.J18X00560) 24-Jan-18 (CTTL, No.J18X00561)	Oct-18 Oct-18 Sep-18 ) Oct-18 Scheduled Calibration Jan-19 Jan-19
Power sensor NRP-Z91 ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzerE5071C Calibrated by:	100542 SN 7464 SN 1525 ID # MY49071430 MY46110673 Name	01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756) 12-Sep-17(SPEAG,No.EX3-7464_Sep17) 02-Oct-17(SPEAG,No.DAE4-1525_Oct17) Cal Date(Calibrated by, Certificate No.) 23-Jan-18 (CTTL, No.J18X00560) 24-Jan-18 (CTTL, No.J18X00561) Function	Oct-18 Oct-18 Sep-18 ) Oct-18 Scheduled Calibration Jan-19 Jan-19
Power sensor NRP-Z91 ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C	100542 SN 7464 SN 1525 ID # MY49071430 MY46110673 Name Zhao Jing	01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756) 12-Sep-17(SPEAG,No.EX3-7464_Sep17) 02-Oct-17(SPEAG,No.DAE4-1525_Oct17) Cal Date(Calibrated by, Certificate No.) 23-Jan-18 (CTTL, No.J18X00560) 24-Jan-18 (CTTL, No.J18X00561) Function SAR Test Engineer	Oct-18 Oct-18 Sep-18 ) Oct-18 Scheduled Calibration Jan-19 Jan-19
Power sensor NRP-Z91 ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzerE5071C Calibrated by: Reviewed by: Approved by:	100542 SN 7464 SN 1525 ID # MY49071430 MY46110673 Name Zhao Jing Lin Hao Qi Dianyuan	01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756) 12-Sep-17(SPEAG,No.EX3-7464_Sep17) 02-Oct-17(SPEAG,No.DAE4-1525_Oct17) Cal Date(Calibrated by, Certificate No.) 23-Jan-18 (CTTL, No.J18X00560) 24-Jan-18 (CTTL, No.J18X00561) Function SAR Test Engineer SAR Test Engineer SAR Project Leader Issued: Apri	Oct-18 Oct-18 Sep-18 Oct-18 Scheduled Calibration Jan-19 Jan-19 Jan-19 Jan-19
Power sensor NRP-Z91 ReferenceProbe EX3DV4 DAE4 Secondary Standards Signal Generator E4438C NetworkAnalyzerE5071C Calibrated by: Reviewed by: Approved by:	100542 SN 7464 SN 1525 ID # MY49071430 MY46110673 Name Zhao Jing Lin Hao Qi Dianyuan	01-Nov-17 (CTTL, No.J17X08756) 01-Nov-17 (CTTL, No.J17X08756) 12-Sep-17(SPEAG,No.EX3-7464_Sep17) 02-Oct-17(SPEAG,No.DAE4-1525_Oct17) Cal Date(Calibrated by, Certificate No.) 23-Jan-18 (CTTL, No.J18X00560) 24-Jan-18 (CTTL, No.J18X00561) Function SAR Test Engineer SAR Test Engineer SAR Project Leader	Oct-18 Oct-18 Sep-18 Oct-18 Scheduled Calibration Jan-19 Jan-19 Jan-19 Jan-19





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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) 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 assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices- Part 1: Device used next to the ear (Frequency range of 300MHz to 6GHz)", July 2016
- c) IEC 62209-2, "Procedure to measure the Specific Absorption Rate (SAR) For wireless communication devices used in close proximity to the human body (frequency range of 30MHz to 6GHz)", March 2010
- d) KDB865664, 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 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: 718-60042