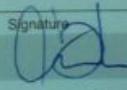
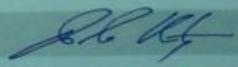
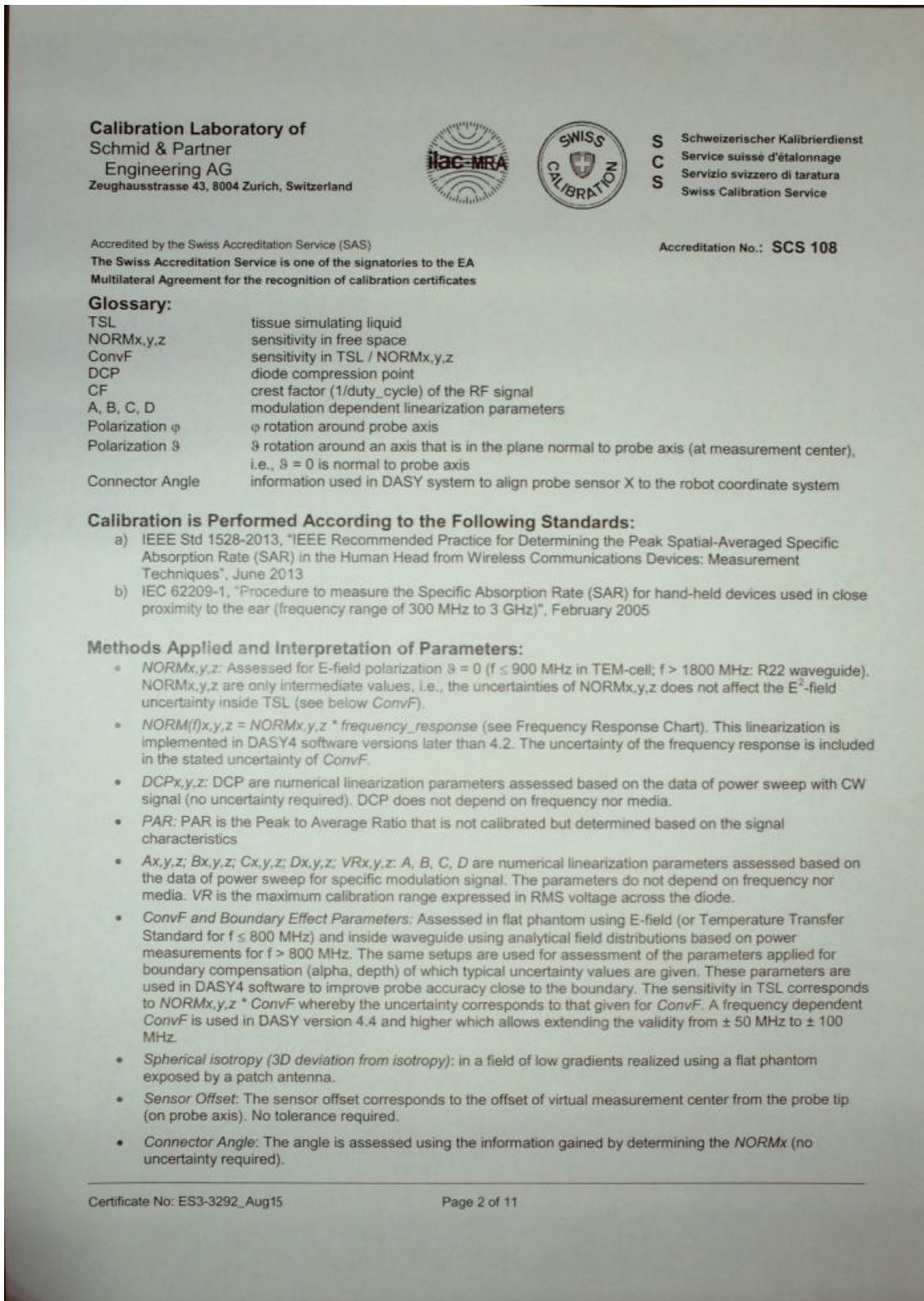


## 1.1. Probe Calibration Certificate

<b>Calibration Laboratory of</b> <b>Schmid &amp; Partner</b> <b>Engineering AG</b> <b>Zeughausstrasse 43, 8004 Zurich, Switzerland</b>		 	<b>S</b> Schweizerischer Kalibrierdienst <b>C</b> Service suisse d'étalonnage <b>S</b> Servizio svizzero di taratura <b>S</b> 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.: <b>SCS 108</b>																																													
Client	<b>CIQ (Auden)</b>																																														
Certificate No: <b>ES3-3292_Aug15</b>																																															
<b>CALIBRATION CERTIFICATE</b>																																															
Object	ES3DV3 - SN:3292																																														
Calibration procedure(s)	QA CAL-01.v9, QA CAL-12.v9, QA CAL-23.v5, QA CAL-25.v6 Calibration procedure for dosimetric E-field probes																																														
Calibration date:	August 15, 2015																																														
This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.  All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$ .  Calibration Equipment used (M&TE critical for calibration)																																															
<table border="1"> <thead> <tr> <th>Primary Standards</th> <th>ID</th> <th>Cal Date (Certificate No.)</th> <th>Scheduled Calibration</th> </tr> </thead> <tbody> <tr> <td>Power meter E4419B</td> <td>GB41293874</td> <td>03-Apr-15 (No. 217-01911)</td> <td>Apr-16</td> </tr> <tr> <td>Power sensor E4412A</td> <td>MY41498087</td> <td>03-Apr-15 (No. 217-01911)</td> <td>Apr-16</td> </tr> <tr> <td>Reference 3 dB Attenuator</td> <td>SN: S5054 (3c)</td> <td>03-Apr-15 (No. 217-01915)</td> <td>Apr-16</td> </tr> <tr> <td>Reference 20 dB Attenuator</td> <td>SN: S5277 (20x)</td> <td>03-Apr-15 (No. 217-01919)</td> <td>Apr-16</td> </tr> <tr> <td>Reference 30 dB Attenuator</td> <td>SN: S5129 (30b)</td> <td>03-Apr-15 (No. 217-01920)</td> <td>Apr-16</td> </tr> <tr> <td>Reference Probe ES3DV2</td> <td>SN: 3013</td> <td>30-Dec-14 (No. ES3-3013, Dec13)</td> <td>Dec-15</td> </tr> <tr> <td>DAE4</td> <td>SN: 660</td> <td>13-Dec-14 (No. DAE4-660, Dec13)</td> <td>Dec-15</td> </tr> <tr> <td>Secondary Standards</td> <td>ID</td> <td>Check Date (in house)</td> <td>Scheduled Check</td> </tr> <tr> <td>RF generator HP 8648C</td> <td>US3642U01700</td> <td>4-Aug-99 (in house check Apr-13)</td> <td>In house check: Apr-16</td> </tr> <tr> <td>Network Analyzer HP 8753E</td> <td>US37390585</td> <td>18-Oct-01 (in house check Oct-13)</td> <td>In house check: Oct-14</td> </tr> </tbody> </table>				Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration	Power meter E4419B	GB41293874	03-Apr-15 (No. 217-01911)	Apr-16	Power sensor E4412A	MY41498087	03-Apr-15 (No. 217-01911)	Apr-16	Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-15 (No. 217-01915)	Apr-16	Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-15 (No. 217-01919)	Apr-16	Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-15 (No. 217-01920)	Apr-16	Reference Probe ES3DV2	SN: 3013	30-Dec-14 (No. ES3-3013, Dec13)	Dec-15	DAE4	SN: 660	13-Dec-14 (No. DAE4-660, Dec13)	Dec-15	Secondary Standards	ID	Check Date (in house)	Scheduled Check	RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16	Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14
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Calibrated by:	Name Claudio Leubler	Function Laboratory Technician																																													
Approved by:	Katja Pokovic	Technical Manager																																													
Issued: August 15, 2015																																															
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.																																															

## Appendix A: Calibration Certificate



ES3DV3 – SN:3292

August 15, 2015

# Probe ES3DV3

SN:3292

Manufactured: July 6, 2010  
Repaired: July 28, 2015  
Calibrated: August 15, 2015

Calibrated for DASY/EASY Systems  
(Note: non-compatible with DASY2 system!)

ES3DV3- SN:3292

August 15, 2015

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3292

### Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup>	0.89	0.95	1.46	$\pm 10.1 \%$
DCP (mV) <sup>B</sup>	107.1	106.1	103.9	

### Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc <sup>E</sup> (k=2)
0	CW	X	0.0	0.0	1.0	0.00	209.7	$\pm 3.8 \%$
		Y	0.0	0.0	1.0		218.8	
		Z	0.0	0.0	1.0		198.5	

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%.

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Pages 5 and 6).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>C</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## Appendix A: Calibration Certificate

ES3DV3— SN:3292

August 15, 2015

### DASY/EASY - Parameters of Probe: ES3DV3 - SN:3292

#### Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha <sup>G</sup>	Depth <sup>G</sup> (mm)	Unct. (k=2)
450	43.5	0.87	6.71	6.71	6.71	0.18	1.80	± 13.3 %
835	41.5	0.90	6.23	6.23	6.23	0.80	1.11	± 12.0 %
900	41.5	0.97	6.71	6.71	6.10	6.71	1.17	± 12.0 %
1810	40.0	1.40	5.07	5.07	5.07	0.61	1.36	± 12.0 %
1900	40.0	1.40	5.03	5.03	5.03	0.45	1.55	± 12.0 %
2100	39.8	1.49	5.04	5.04	5.04	0.77	1.17	± 12.0 %
2450	39.2	1.80	4.43	4.43	4.43	0.73	1.23	± 12.0 %

<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-8 GHz at any distance larger than half the probe tip diameter from the boundary.

Certificate No: ES3-3292\_Aug15

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ES3DV3- SN:3292

August 15, 2015

**DASY/EASY - Parameters of Probe: ES3DV3 - SN:3292****Calibration Parameter Determined in Body Tissue Simulating Media**

f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha <sup>G</sup>	Depth <sup>H</sup> (mm)	Unct. (k=2)
450	56.7	0.94	7.10	7.10	7.10	0.13	1.00	± 13.3 %
835	55.2	0.97	6.11	6.11	6.11	0.36	1.78	± 12.0 %
900	55.0	1.05	5.97	5.97	5.97	0.73	1.22	± 12.0 %
1810	53.3	1.52	4.79	4.79	4.79	0.59	1.45	± 12.0 %
1900	53.3	1.52	4.66	4.66	4.66	0.41	1.79	± 12.0 %
2100	53.2	1.62	4.77	4.77	4.77	0.63	1.42	± 12.0 %
2450	52.7	1.95	4.23	4.23	4.23	0.66	0.98	± 12.0 %

<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

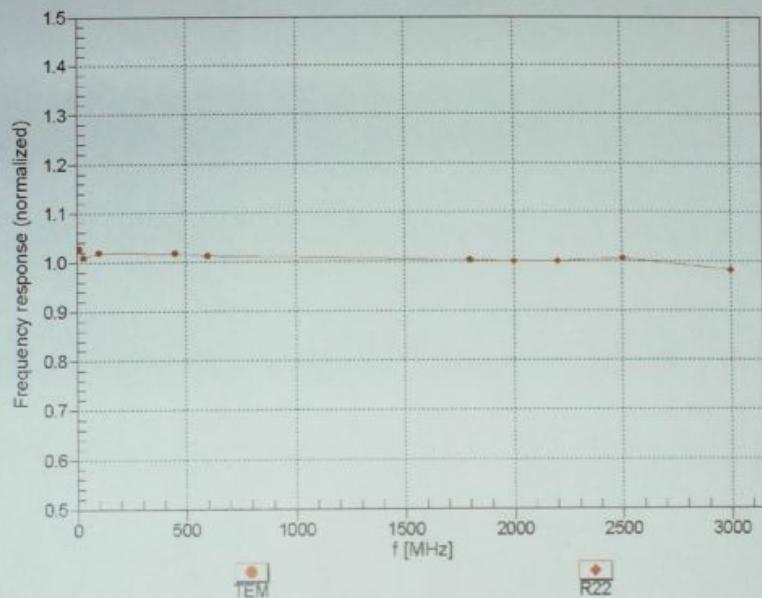
<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

ES3DV3- SN:3292

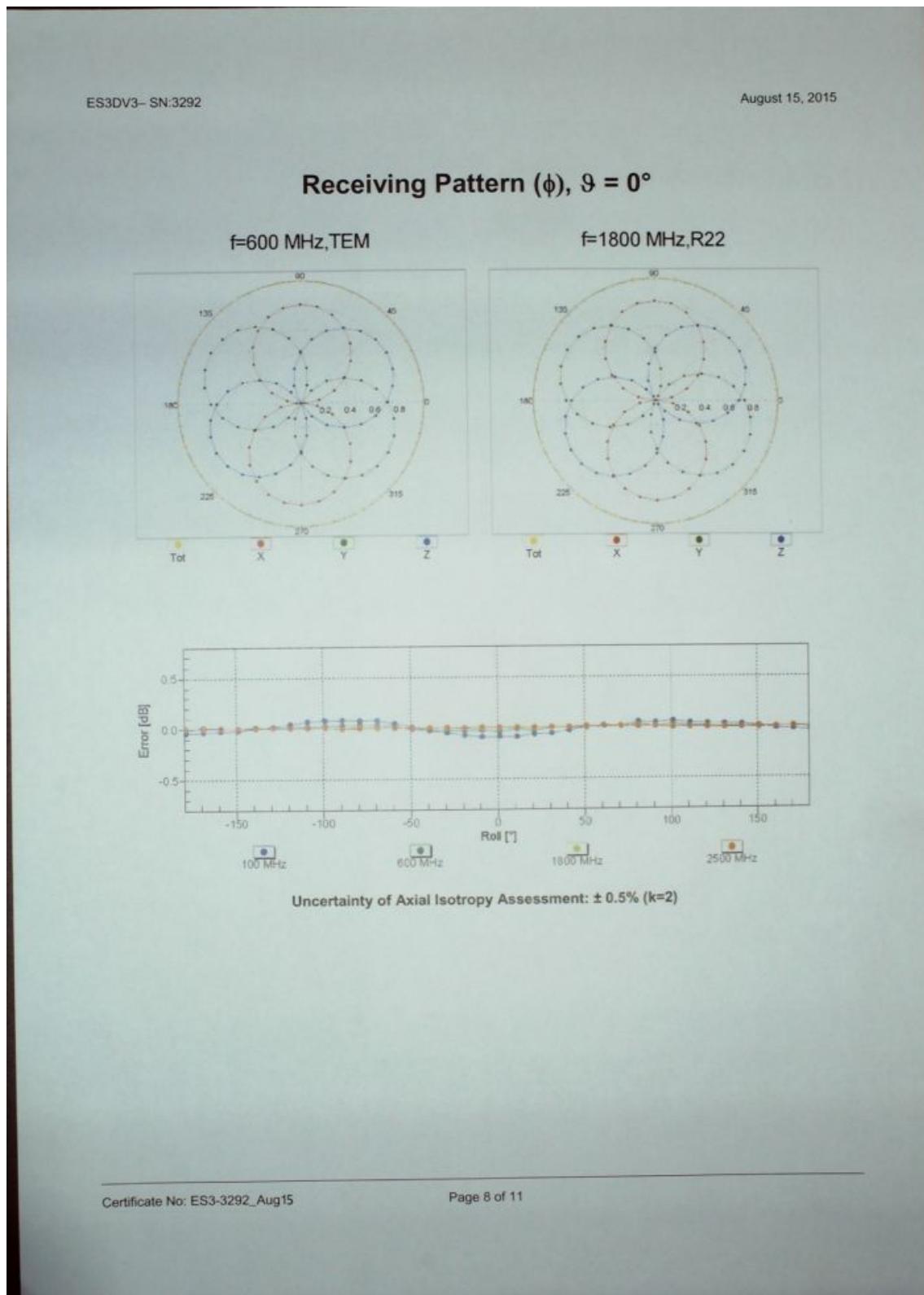
August 15, 2015

**Frequency Response of E-Field**  
(TEM-Cell:ifi110 EXX, Waveguide: R22)

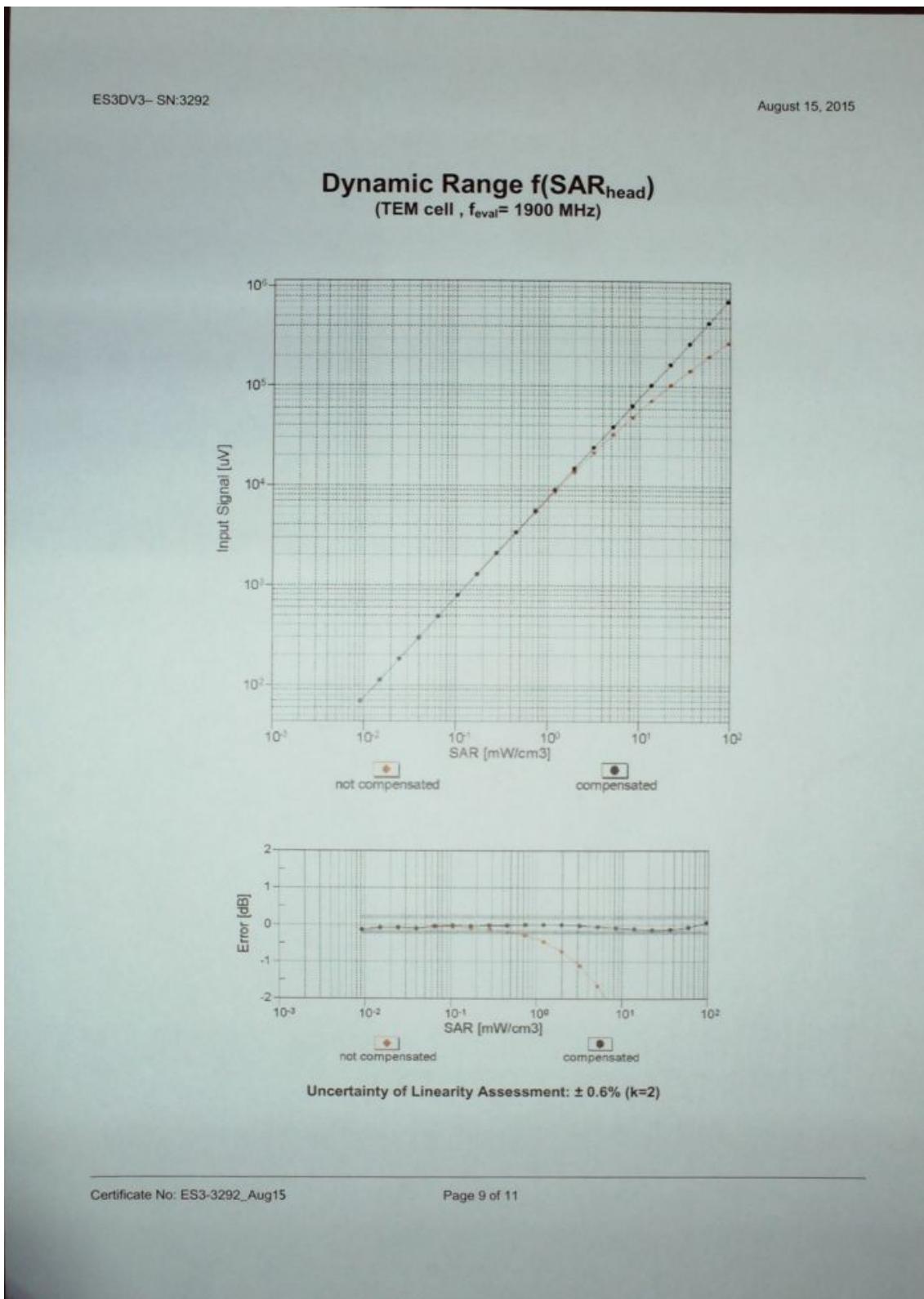


Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

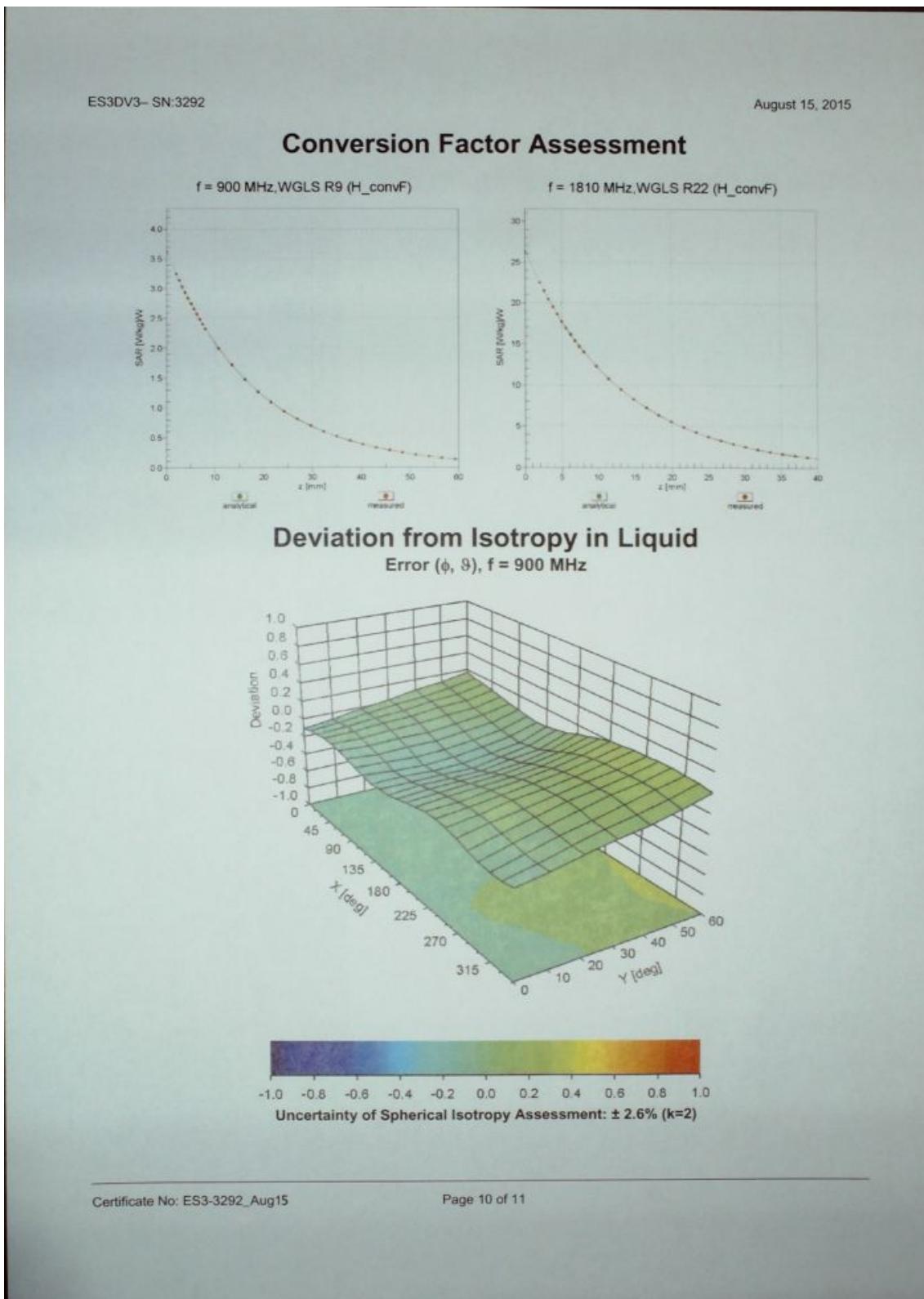
## Appendix A: Calibration Certificate



## Appendix A: Calibration Certificate



## Appendix A: Calibration Certificate



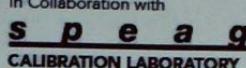
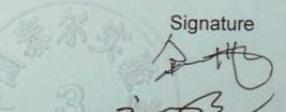
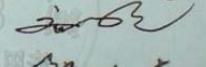
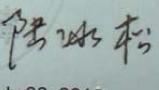
ES3DV3- SN:3292	August 15, 2015
<b>DASY/EASY - Parameters of Probe: ES3DV3 - SN:3292</b>	
<b>Other Probe Parameters</b>	
Sensor Arrangement	Triangular
Connector Angle (°)	-8.9
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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Certificate No: ES3-3292\_Aug15

Page 11 of 11

## 1.2. D835V2 Dipole Calibration Certificate

 <b>In Collaboration with</b>  <b>CALIBRATION LABORATORY</b>		  <b>CALIBRATION</b> <b>No. L0570</b>	
Client	CIO-SZ(Auden)		Certificate No: Z15-97067
<b>CALIBRATION CERTIFICATE</b>			
Object	D835V2 - SN: 4d134		
Calibration Procedure(s)	TMC-OS-E-02-194 Calibration procedure for dipole validation kits		
Calibration date:	July 24, 2015		
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature(<math>22\pm3</math>)°C and humidity&lt;70%.</p> <p>Calibration Equipment used (M&amp;TE critical for calibration)</p>			
Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRV/D	102083	11-Sep-14 (TMC, No.JZ13-443)	Sep-15
Power sensor NRV-Z5	100595	11-Sep-14 (TMC, No.JZ13-443)	Sep-15
Reference Probe EX3DV4	SN 3846	3- Sep-14 (SPEAG, No.EX3-3846_Sep13)	Sep-15
DAE4	SN 1331	23-Jan-15 (SPEAG, DAE4-1331_Jan14)	Jan-16
Signal Generator E4438C	MY49070393	13-Nov-14 (TMC, No.JZ13-394)	Nov-15
Network Analyzer E8362B	MY43021135	19-Oct-14 (TMC, No.JZ13-278)	Oct-15
Calibrated by:	Name Yu Zongying	Function SAR Test Engineer	Signature 
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	
Issued: July 28, 2015			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			

Certificate No: Z15-97067

Page 1 of 8

 In Collaboration with  
**s p e a g**  
CALIBRATION LABORATORY

Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China  
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504  
E-mail: [cttl@chinattl.com](mailto:cttl@chinattl.com) Http://www.chinattl.cn



**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, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005
- c) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

**Additional Documentation:**

- d) 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: Z15-97067

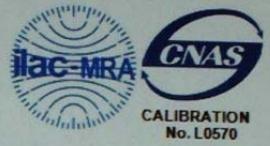
Page 2 of 8

## Appendix A: Calibration Certificate

 <p style="text-align: center;"><b>TTL</b> In Collaboration with <b>s p e a g</b> <b>CALIBRATION LABORATORY</b></p> <p>Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China          Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504          E-mail: ctll@chinattl.com Http://www.chinattl.cn</p>	 <p style="text-align: right;"><b>ILAC-MRA</b> <b>CNAS</b> <b>CALIBRATION</b> <b>No. L0570</b></p>																		
<p><b>Measurement Conditions</b>          DASY system configuration, as far as not given on page 1.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">DASY Version</td> <td style="width: 33%;">DASY52</td> <td style="width: 33%;">52.8.8.1222</td> </tr> <tr> <td>Extrapolation</td> <td colspan="2">Advanced Extrapolation</td> </tr> <tr> <td>Phantom</td> <td colspan="2">Triple Flat Phantom 5.1C</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 colspan="2">dx, dy, dz = 5 mm</td> </tr> <tr> <td>Frequency</td> <td colspan="2">835 MHz ± 1 MHz</td> </tr> </table>		DASY Version	DASY52	52.8.8.1222	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	
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<p><b>SAR result with Head TSL</b>          The following parameters and calculations were applied.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">SAR averaged over 1 <math>cm^3</math> (1 g) of Head TSL</td> <td style="width: 33%;">Condition</td> <td style="width: 33%;"></td> </tr> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>2.41 mW / g</td> </tr> <tr> <td>SAR for nominal Head TSL parameters</td> <td>normalized to 1W</td> <td>9.62 mW /g ± 20.8 % (k=2)</td> </tr> <tr> <td>SAR averaged over 10 <math>cm^3</math> (10 g) of Head TSL</td> <td>Condition</td> <td></td> </tr> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>1.57 mW / g</td> </tr> <tr> <td>SAR for nominal Head TSL parameters</td> <td>normalized to 1W</td> <td>6.27 mW /g ± 20.4 % (k=2)</td> </tr> </table>		SAR averaged over 1 $cm^3$ (1 g) of Head TSL	Condition		SAR measured	250 mW input power	2.41 mW / g	SAR for nominal Head TSL parameters	normalized to 1W	9.62 mW /g ± 20.8 % (k=2)	SAR averaged over 10 $cm^3$ (10 g) of Head TSL	Condition		SAR measured	250 mW input power	1.57 mW / g	SAR for nominal Head TSL parameters	normalized to 1W	6.27 mW /g ± 20.4 % (k=2)
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SAR measured	250 mW input power	1.57 mW / g																	
SAR for nominal Head TSL parameters	normalized to 1W	6.27 mW /g ± 20.4 % (k=2)																	
<p><b>Body TSL parameters</b>          The following parameters and calculations were applied.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th></th> <th>Temperature</th> <th>Permittivity</th> <th>Conductivity</th> </tr> <tr> <td>Nominal Body TSL parameters</td> <td>22.0 °C</td> <td>55.2</td> <td>0.97 mho/m</td> </tr> <tr> <td>Measured Body TSL parameters</td> <td>(22.0 ± 0.2) °C</td> <td>55.6 ± 6 %</td> <td>0.99 mho/m ± 6 %</td> </tr> <tr> <td>Body TSL temperature change during test</td> <td>&lt;1.0 °C</td> <td>----</td> <td>----</td> </tr> </table>			Temperature	Permittivity	Conductivity	Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m	Measured Body TSL parameters	(22.0 ± 0.2) °C	55.6 ± 6 %	0.99 mho/m ± 6 %	Body TSL temperature change during test	<1.0 °C	----	----		
	Temperature	Permittivity	Conductivity																
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m																
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.6 ± 6 %	0.99 mho/m ± 6 %																
Body TSL temperature change during test	<1.0 °C	----	----																
<p><b>SAR result with Body TSL</b>          The following parameters and calculations were applied.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">SAR averaged over 1 <math>cm^3</math> (1 g) of Body TSL</td> <td style="width: 33%;">Condition</td> <td style="width: 33%;"></td> </tr> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>2.47 mW / g</td> </tr> <tr> <td>SAR for nominal Body TSL parameters</td> <td>normalized to 1W</td> <td>9.77 mW /g ± 20.8 % (k=2)</td> </tr> <tr> <td>SAR averaged over 10 <math>cm^3</math> (10 g) of Body TSL</td> <td>Condition</td> <td></td> </tr> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>1.64 mW / g</td> </tr> <tr> <td>SAR for nominal Body TSL parameters</td> <td>normalized to 1W</td> <td>6.50 mW /g ± 20.4 % (k=2)</td> </tr> </table>		SAR averaged over 1 $cm^3$ (1 g) of Body TSL	Condition		SAR measured	250 mW input power	2.47 mW / g	SAR for nominal Body TSL parameters	normalized to 1W	9.77 mW /g ± 20.8 % (k=2)	SAR averaged over 10 $cm^3$ (10 g) of Body TSL	Condition		SAR measured	250 mW input power	1.64 mW / g	SAR for nominal Body TSL parameters	normalized to 1W	6.50 mW /g ± 20.4 % (k=2)
SAR averaged over 1 $cm^3$ (1 g) of Body TSL	Condition																		
SAR measured	250 mW input power	2.47 mW / g																	
SAR for nominal Body TSL parameters	normalized to 1W	9.77 mW /g ± 20.8 % (k=2)																	
SAR averaged over 10 $cm^3$ (10 g) of Body TSL	Condition																		
SAR measured	250 mW input power	1.64 mW / g																	
SAR for nominal Body TSL parameters	normalized to 1W	6.50 mW /g ± 20.4 % (k=2)																	

Certificate No: Z15-97067

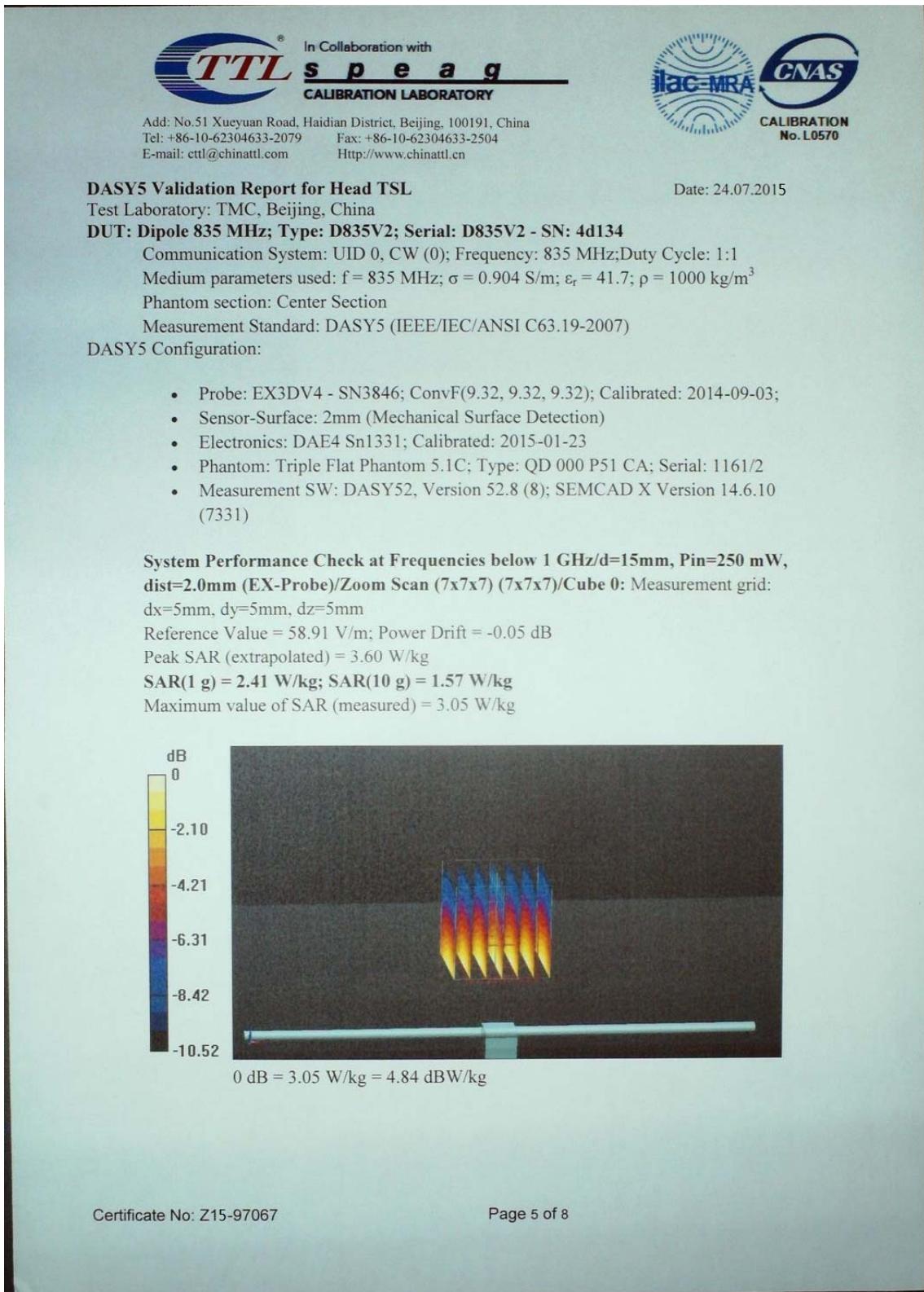
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 In Collaboration with <b>s p e a g</b> CALIBRATION LABORATORY					
Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504 E-mail: <a href="mailto:cttl@chinattl.com">cttl@chinattl.com</a> Http://www.chinattl.cn					
<b>Appendix</b>					
<b>Antenna Parameters with Head TSL</b>					
<table border="1" style="width: 100%;"><tr><td style="padding: 2px;">Impedance, transformed to feed point</td><td style="padding: 2px; text-align: right;"><math>48.8\Omega + 3.34j\Omega</math></td></tr><tr><td style="padding: 2px;">Return Loss</td><td style="padding: 2px; text-align: right;">- 28.9dB</td></tr></table>		Impedance, transformed to feed point	$48.8\Omega + 3.34j\Omega$	Return Loss	- 28.9dB
Impedance, transformed to feed point	$48.8\Omega + 3.34j\Omega$				
Return Loss	- 28.9dB				
<b>Antenna Parameters with Body TSL</b>					
<table border="1" style="width: 100%;"><tr><td style="padding: 2px;">Impedance, transformed to feed point</td><td style="padding: 2px; text-align: right;"><math>50.9\Omega + 7.08j\Omega</math></td></tr><tr><td style="padding: 2px;">Return Loss</td><td style="padding: 2px; text-align: right;">- 23.0dB</td></tr></table>		Impedance, transformed to feed point	$50.9\Omega + 7.08j\Omega$	Return Loss	- 23.0dB
Impedance, transformed to feed point	$50.9\Omega + 7.08j\Omega$				
Return Loss	- 23.0dB				
<b>General Antenna Parameters and Design</b>					
<table border="1" style="width: 100%;"><tr><td style="padding: 2px;">Electrical Delay (one direction)</td><td style="padding: 2px; text-align: right;">1.261 ns</td></tr></table>		Electrical Delay (one direction)	1.261 ns		
Electrical Delay (one direction)	1.261 ns				
After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.					
<p>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.</p> <p>No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.</p>					
<b>Additional EUT Data</b>					
<table border="1" style="width: 100%;"><tr><td style="padding: 2px;">Manufactured by</td><td style="padding: 2px; text-align: right;">SPEAG</td></tr></table>		Manufactured by	SPEAG		
Manufactured by	SPEAG				

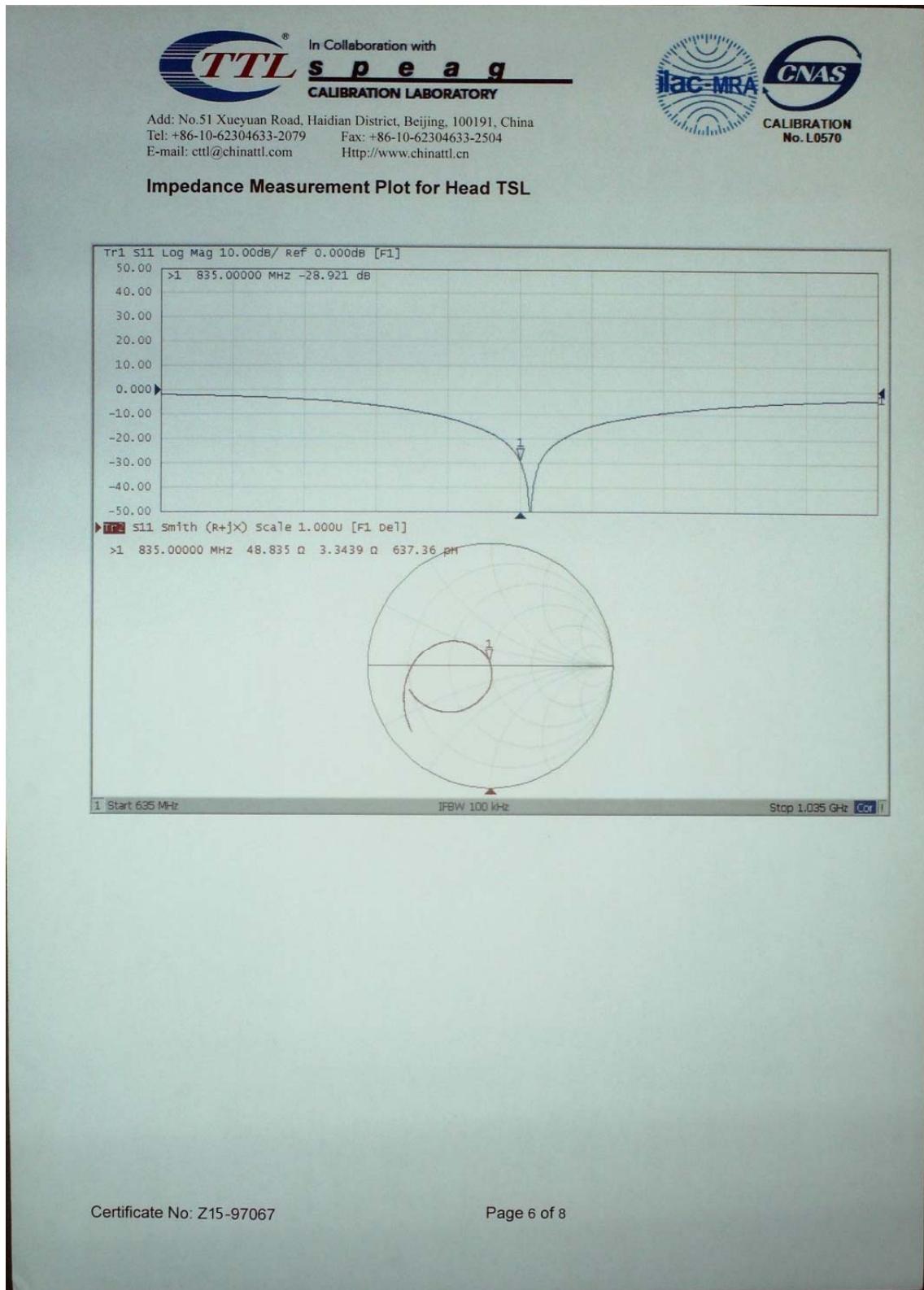
Certificate No: Z15-97067

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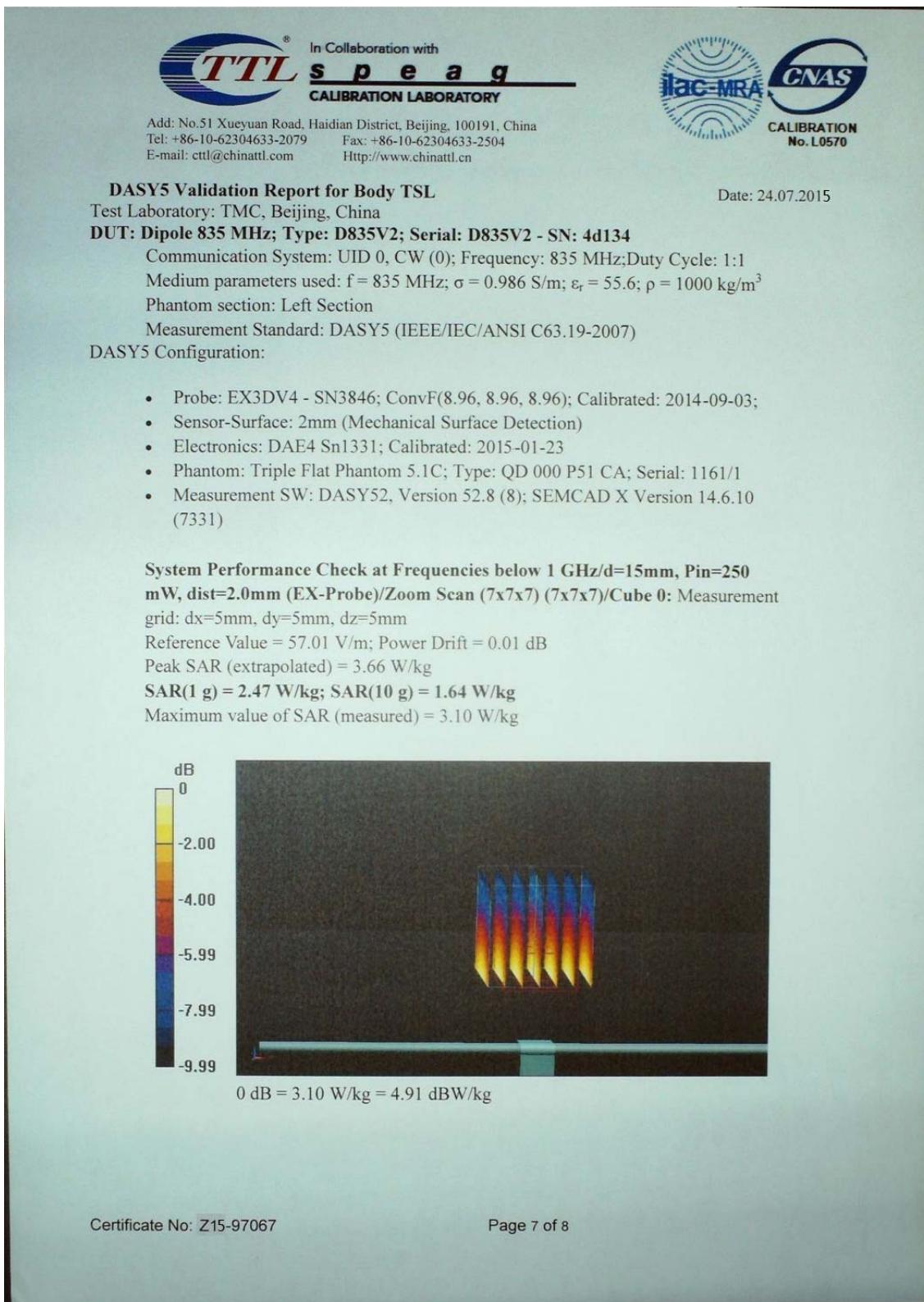
## Appendix A: Calibration Certificate



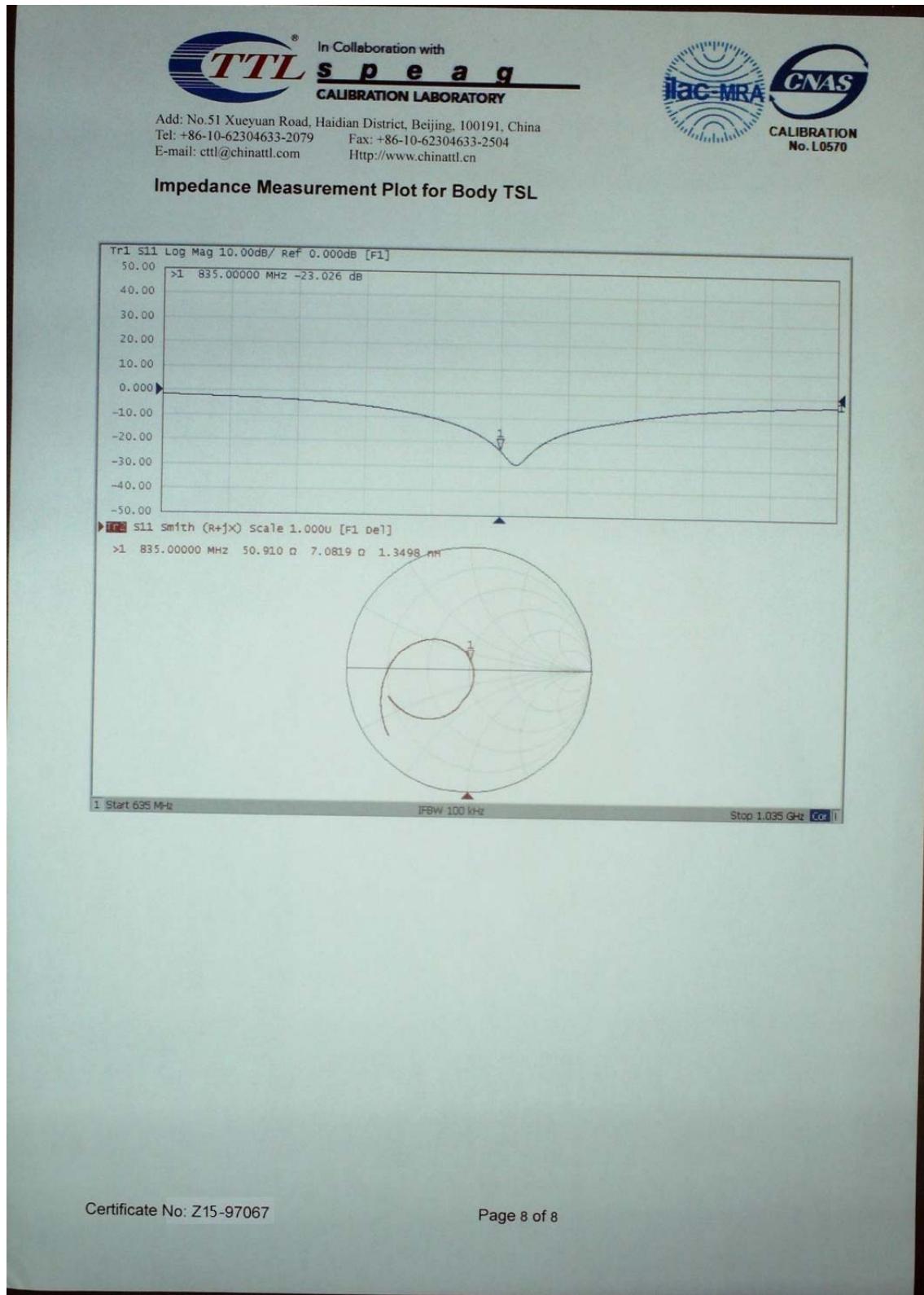
## Appendix A: Calibration Certificate



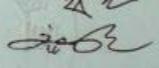
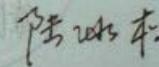
## Appendix A: Calibration Certificate



## Appendix A: Calibration Certificate



### 1.3. D900V2 Dipole Calibration Certificate

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Client	CIQ-SZ(Auden)	Certificate No: Z15-97068	
<b>CALIBRATION CERTIFICATE</b>			
Object	D900V2 - SN: 1d129		
Calibration Procedure(s)	TMC-OS-E-02-194 Calibration procedure for dipole validation kits		
Calibration date:	September 1, 2015		
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature(<math>22\pm3</math>)°C and humidity&lt;70%.</p> <p>Calibration Equipment used (M&amp;TE critical for calibration)</p>			
Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRV	102083	11-Sep-14 (TMC, No.JZ13-443)	Sep-15
Power sensor NRV-Z5	100595	11-Sep-14 (TMC, No. JZ13-443)	Sep -15
Reference Probe ES3DV3	SN 3149	5- Sep-14 (SPEAG, No.ES3-3149_Sep13)	Sep-15
DAE3	SN 536	23-Jan-15 (SPEAG, DAE3-536_Jan14)	Jan -16
Signal Generator E4438C	MY49070393	13-Nov-14 (TMC, No.JZ13-394)	Nov-15
Network Analyzer E8362B	MY43021135	19-Oct-14 (TMC, No.JZ13-278)	Oct-15
Calibrated by:	Name	Function	Signature
	Zhao Jing	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	
Issued: September 4, 2015			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			
Certificate No: Z15-97068		Page 1 of 8	



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E-mail: [ctl@chinatl.com](mailto:ctl@chinatl.com) Http://www.chinatl.cn



CALIBRATION  
No. L0570

**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, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005
- c) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

**Additional Documentation:**

- d) 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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**CNAS**  
 CALIBRATION  
 No. L0570

### Measurement Conditions

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

DASY Version	DASY52	52.8.8.1222
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	900 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	0.97 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.7 ± 6 %	0.98 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	---	---

### SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.64 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	10.5 mW /g ± 20.8 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.70 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	6.78 mW /g ± 20.4 % (k=2)

### Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.0	1.05 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	56.4 ± 6 %	1.05 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	---	---

### SAR result with Body TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.64 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	10.7 mW /g ± 20.8 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	1.73 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	6.96 mW /g ± 20.4 % (k=2)

Certificate No: Z15-97068

Page 3 of 8



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CALIBRATION  
No. L0570

### Appendix

#### Antenna Parameters with Head TSL

Impedance, transformed to feed point	$45.8\Omega + 4.28j\Omega$
Return Loss	- 24.0dB

#### Antenna Parameters with Body TSL

Impedance, transformed to feed point	$48.5\Omega + 6.67j\Omega$
Return Loss	- 23.2dB

#### General Antenna Parameters and Design

Electrical Delay (one direction)	1.384 ns
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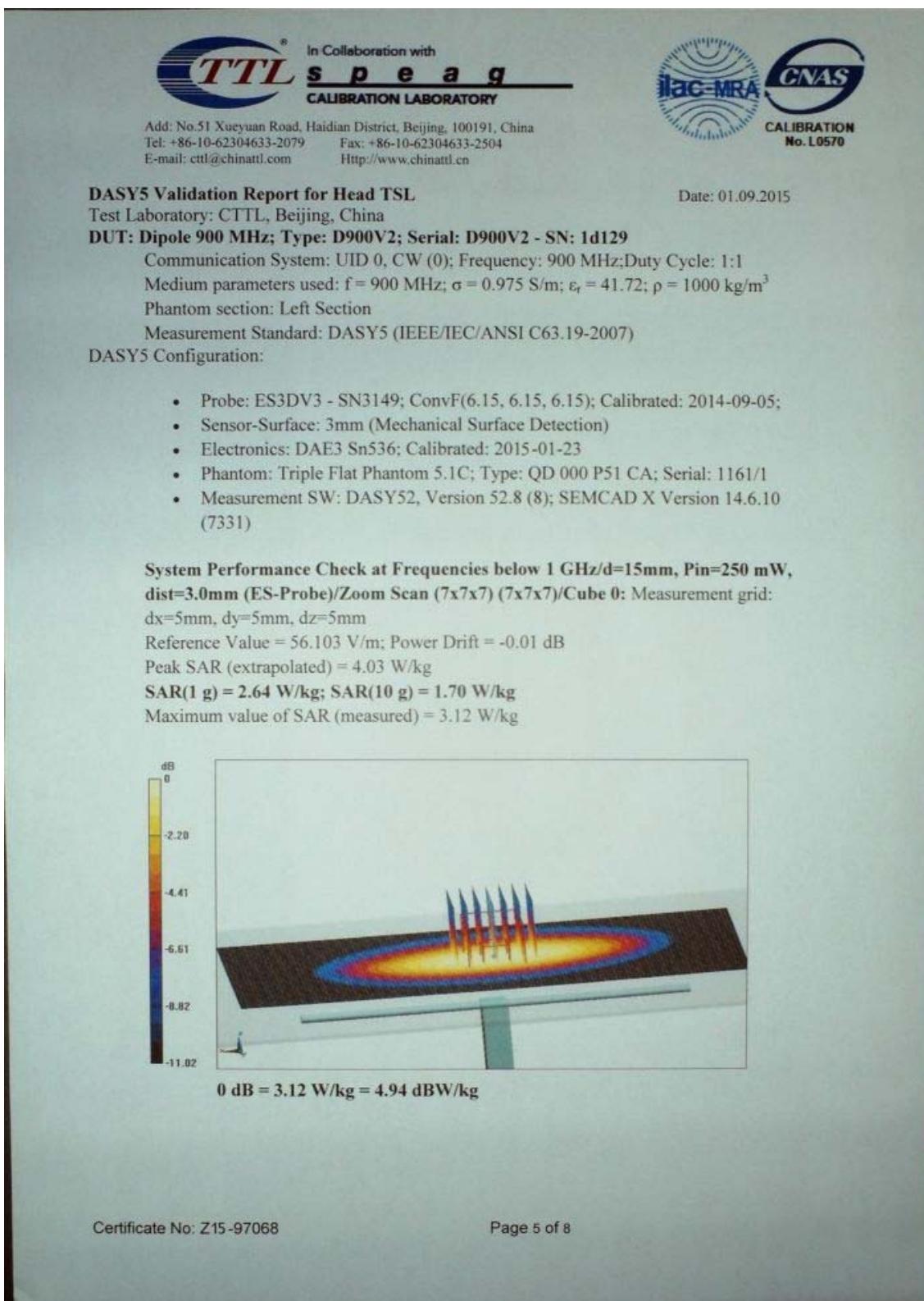
After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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

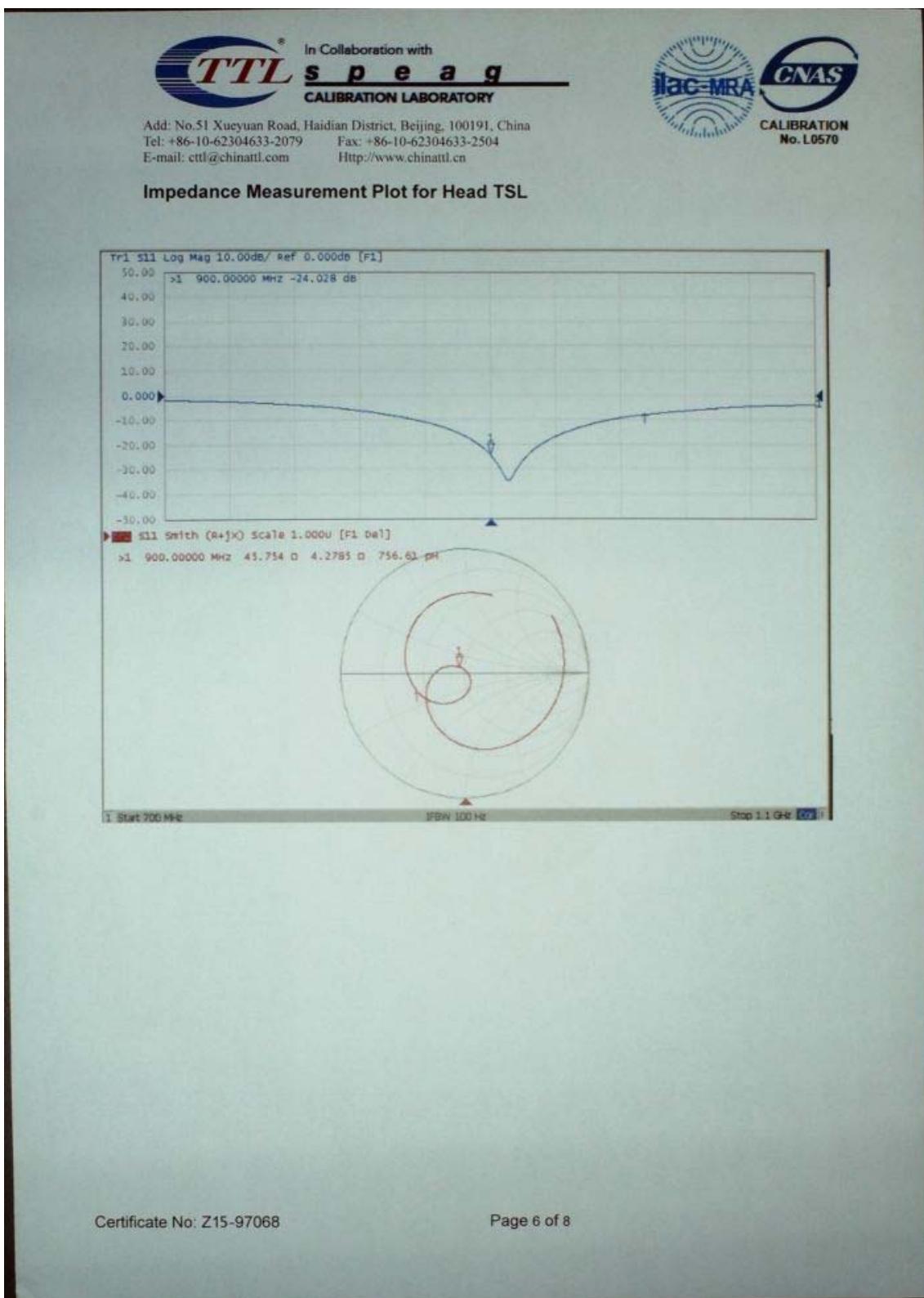
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

#### Additional EUT Data

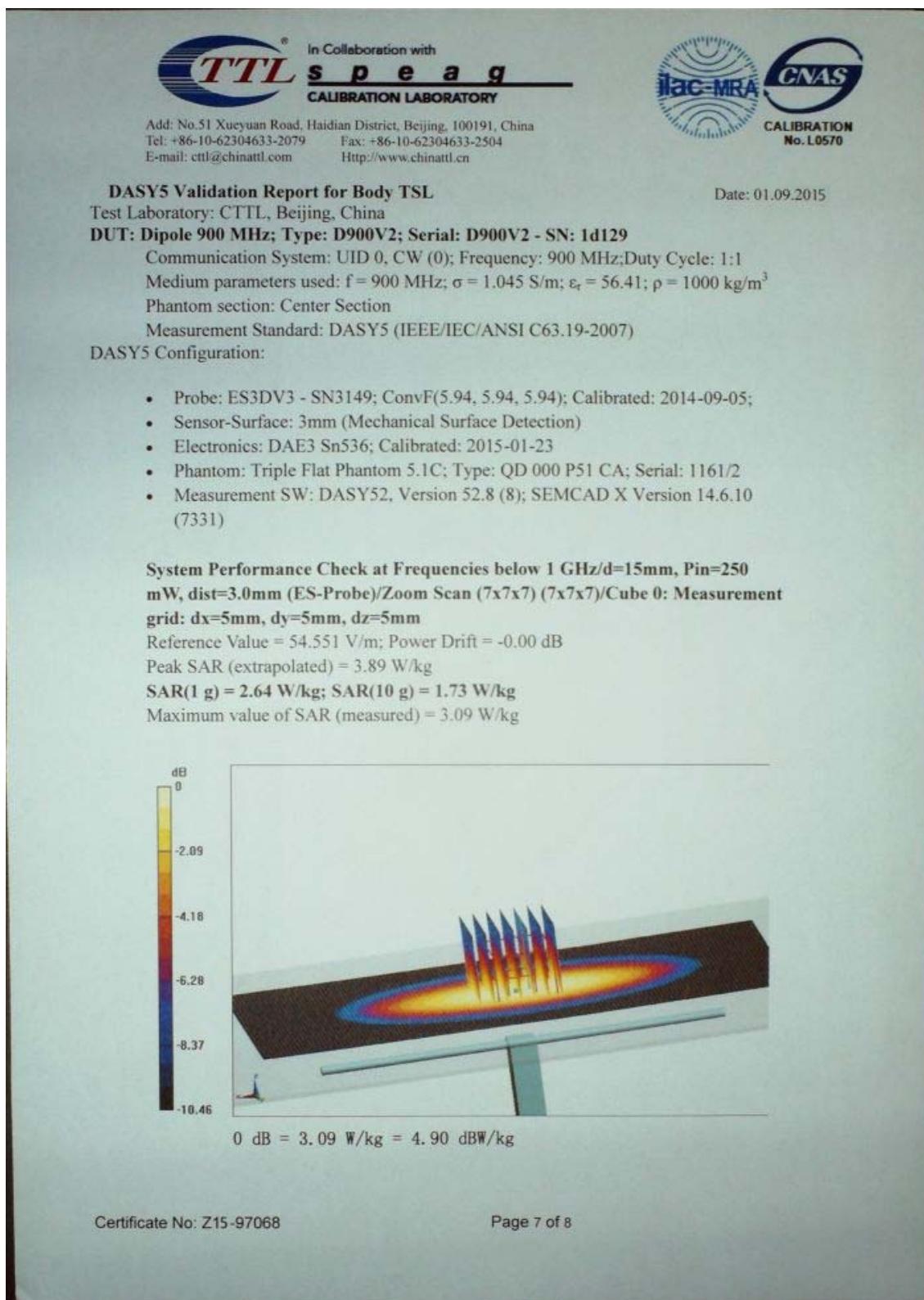
Manufactured by	SPEAG
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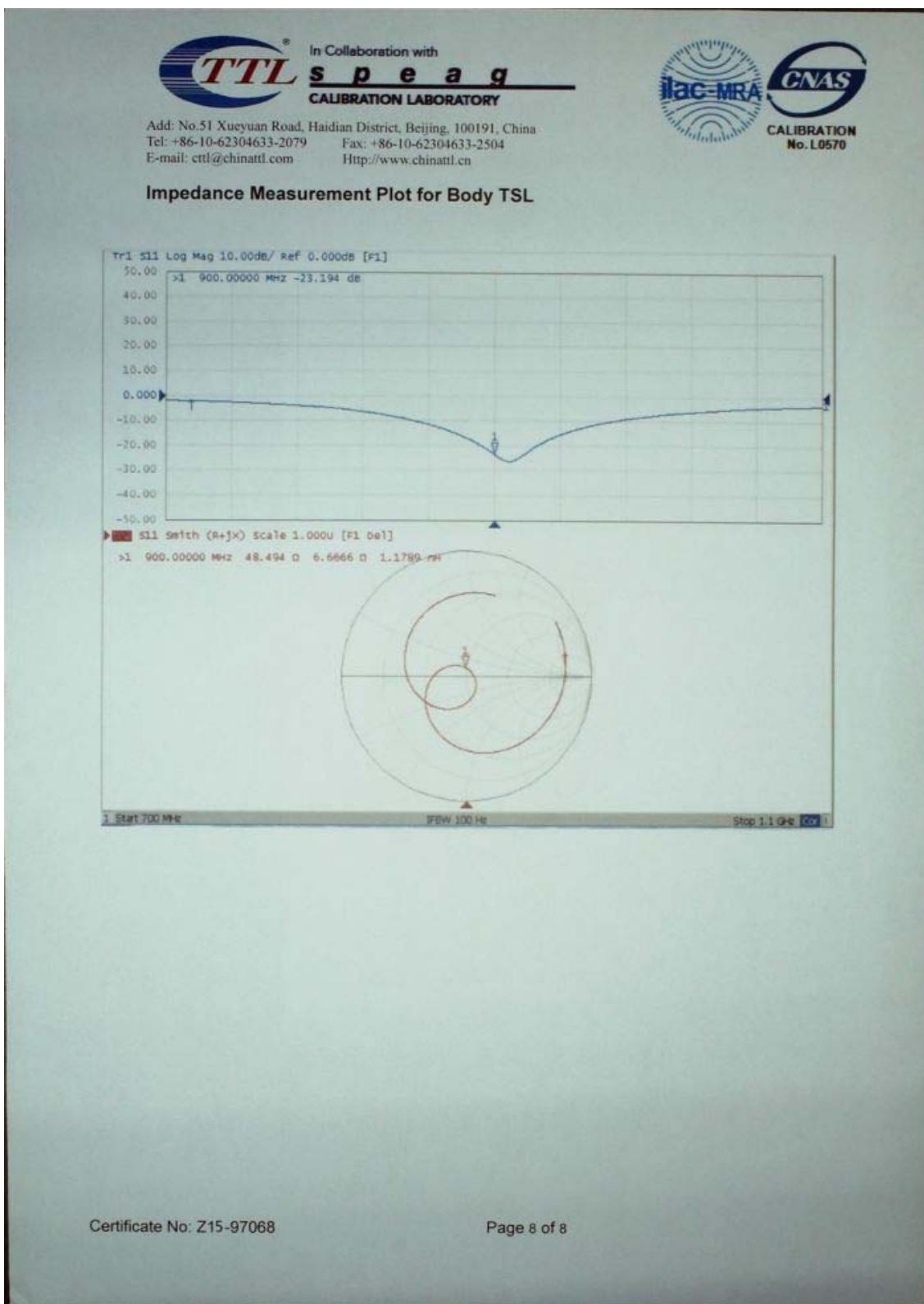
## Appendix A: Calibration Certificate



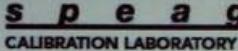
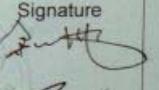
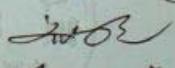
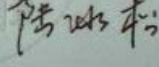
## Appendix A: Calibration Certificate



## Appendix A: Calibration Certificate



## 1.4. D1750V2 Dipole Calibration Certificate

 <b>In Collaboration with</b> 		  <b>CALIBRATION</b> <b>No. L0570</b>	
Client	Certificate No: Z15-97069		
<b>CALIBRATION CERTIFICATE</b>			
Object	D1750V2 - SN: 1062		
Calibration Procedure(s)	TMC-OS-E-02-194 Calibration procedure for dipole validation kits		
Calibration date:	July 25, 2015		
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature(<math>22\pm3</math>)°C and humidity&lt;70%.</p>			
Calibration Equipment used (M&TE critical for calibration)			
Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRV	102083	11-Sep-14 (TMC, No.JZ13-443)	Sep-15
Power sensor NRV-Z5	100595	11-Sep-14 (TMC, No. JZ13-443)	Sep-15
Reference Probe EX3DV4	SN 3846	3- Sep-14 (SPEAG, No.EX3-3846_Sep13)	Sep-15
DAE4	SN 1331	23-Jan-15 (SPEAG, DAE4-1331_Jan14)	Jan -16
Signal Generator E4438C	MY49070393	13-Nov-14 (TMC, No.JZ13-394)	Nov-15
Network Analyzer E8362B	MY43021135	19-Oct-14 (TMC, No.JZ13-278)	Oct-15
Calibrated by:	Name Yu Zongying	Function SAR Test Engineer	Signature 
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	
Issued: July 28, 2015			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			
Certificate No: Z15-97069		Page 1 of 8	



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CALIBRATION  
No. L0570

**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, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005
- c) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

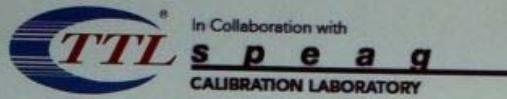
**Additional Documentation:**

- d) 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	52.8.8.1222
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	1750 MHz ± 1 MHz	

### Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.7 ± 6 %	1.35 mho/m ± 6 %
Head TSL temperature change during test	<1.0 °C	---	---

### SAR result with Head TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.20 mW / g
SAR for nominal Head TSL parameters:	normalized to 1W	37.1 mW /g ± 20.8 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	4.97 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	20.0 mW /g ± 20.4 % (k=2)

### Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.3 ± 6 %	1.47 mho/m ± 6 %
Body TSL temperature change during test	<1.0 °C	---	---

### SAR result with Body TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.22 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	37.3 mW /g ± 20.8 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	4.95 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	20.0 mW /g ± 20.4 % (k=2)

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CALIBRATION  
No. L0570

### Appendix

#### Antenna Parameters with Head TSL

Impedance, transformed to feed point	$51.1\Omega + 1.62j\Omega$
Return Loss	- 34.2dB

#### Antenna Parameters with Body TSL

Impedance, transformed to feed point	$49.2\Omega + 4.25j\Omega$
Return Loss	- 27.2dB

#### General Antenna Parameters and Design

Electrical Delay (one direction)	1.257 ns
----------------------------------	----------

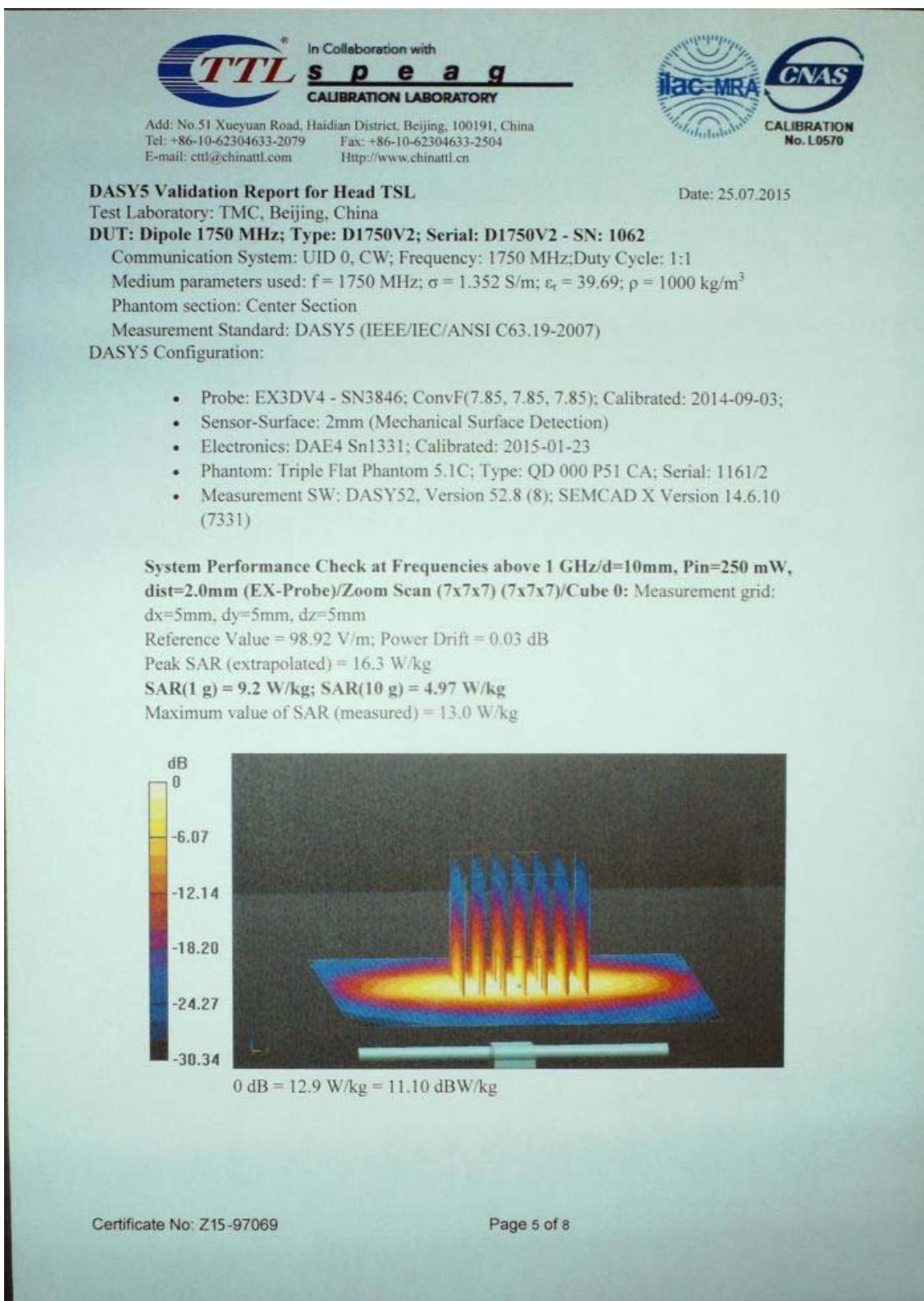
After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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.

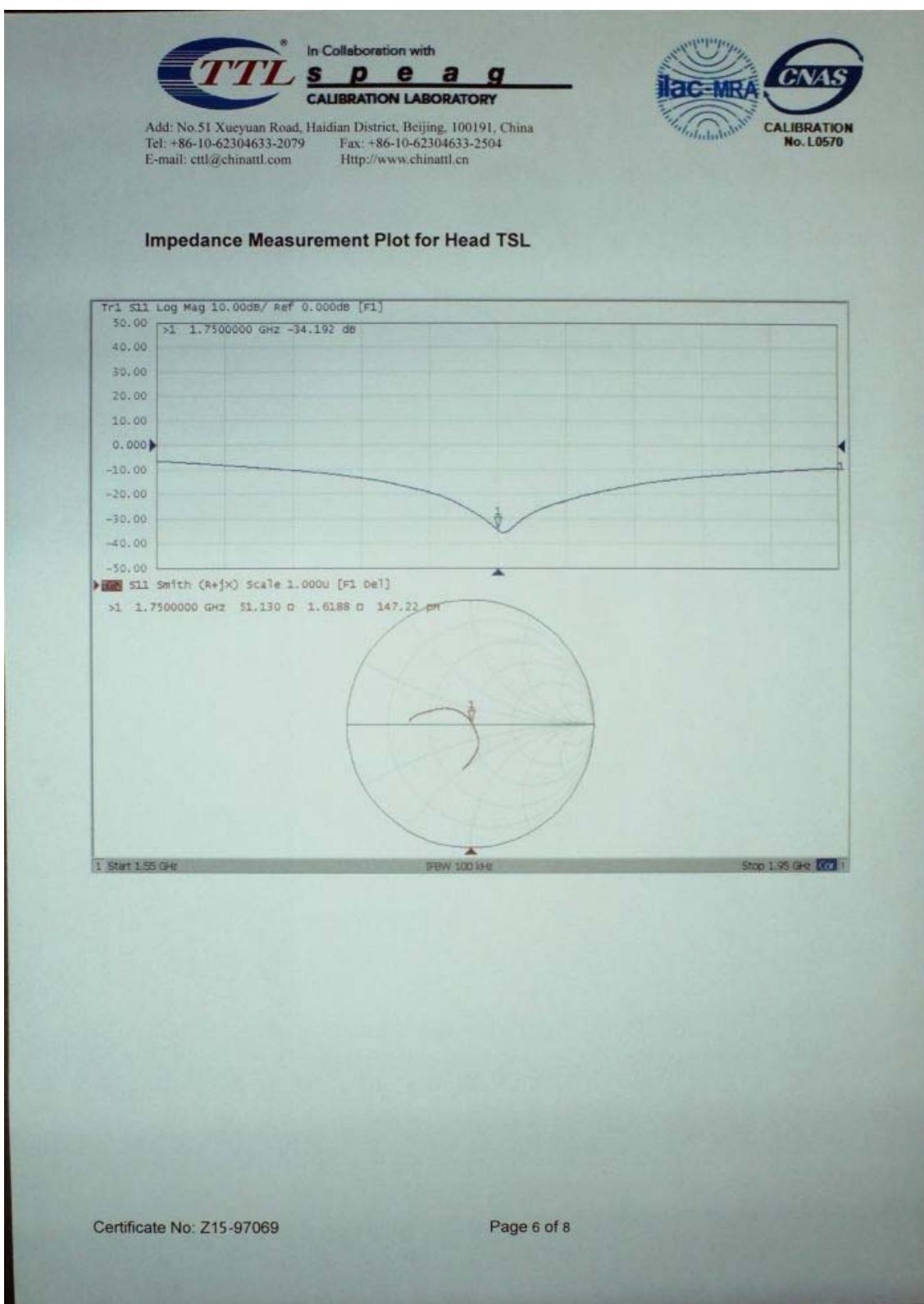
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

#### Additional EUT Data

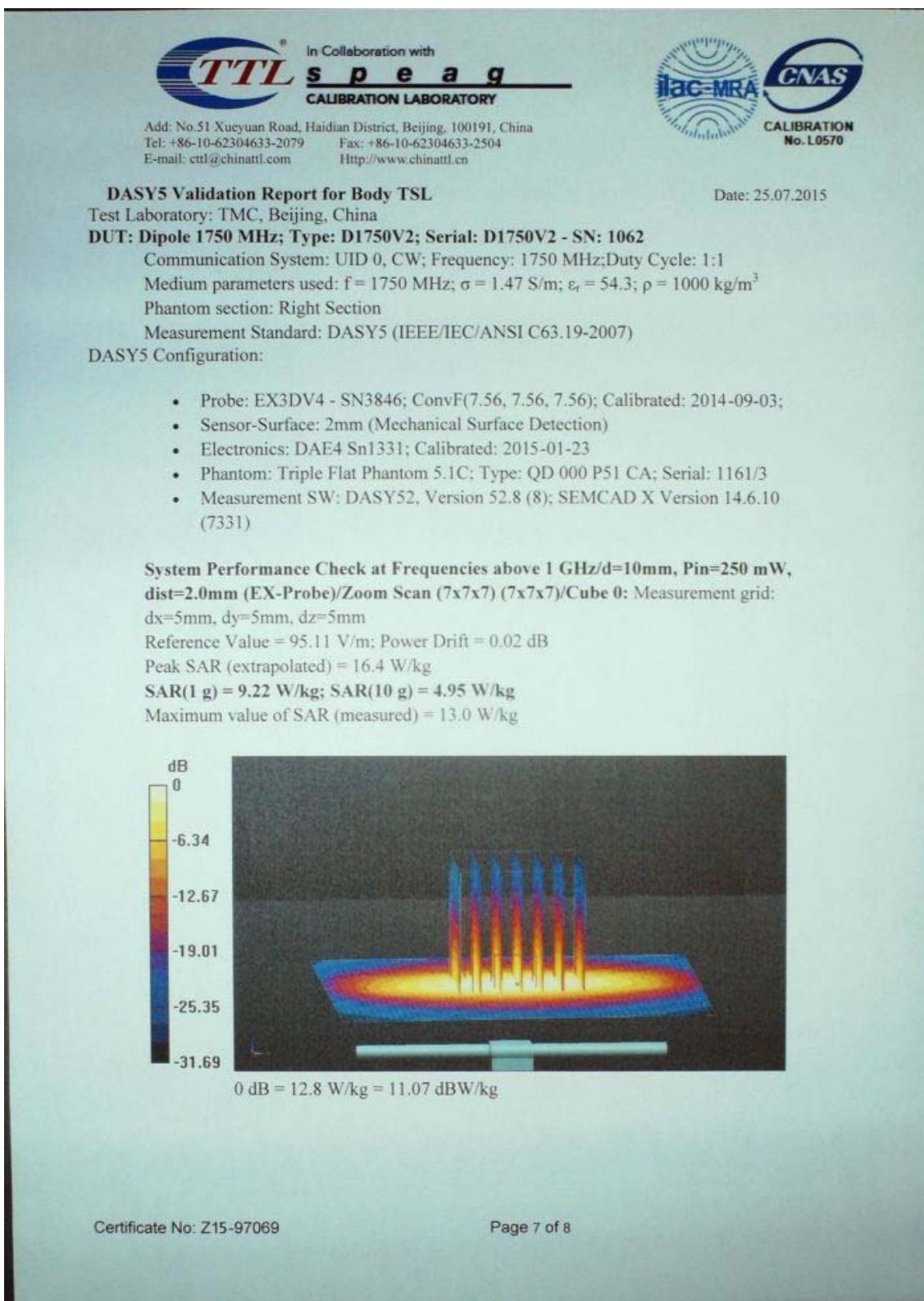
Manufactured by	SPEAG
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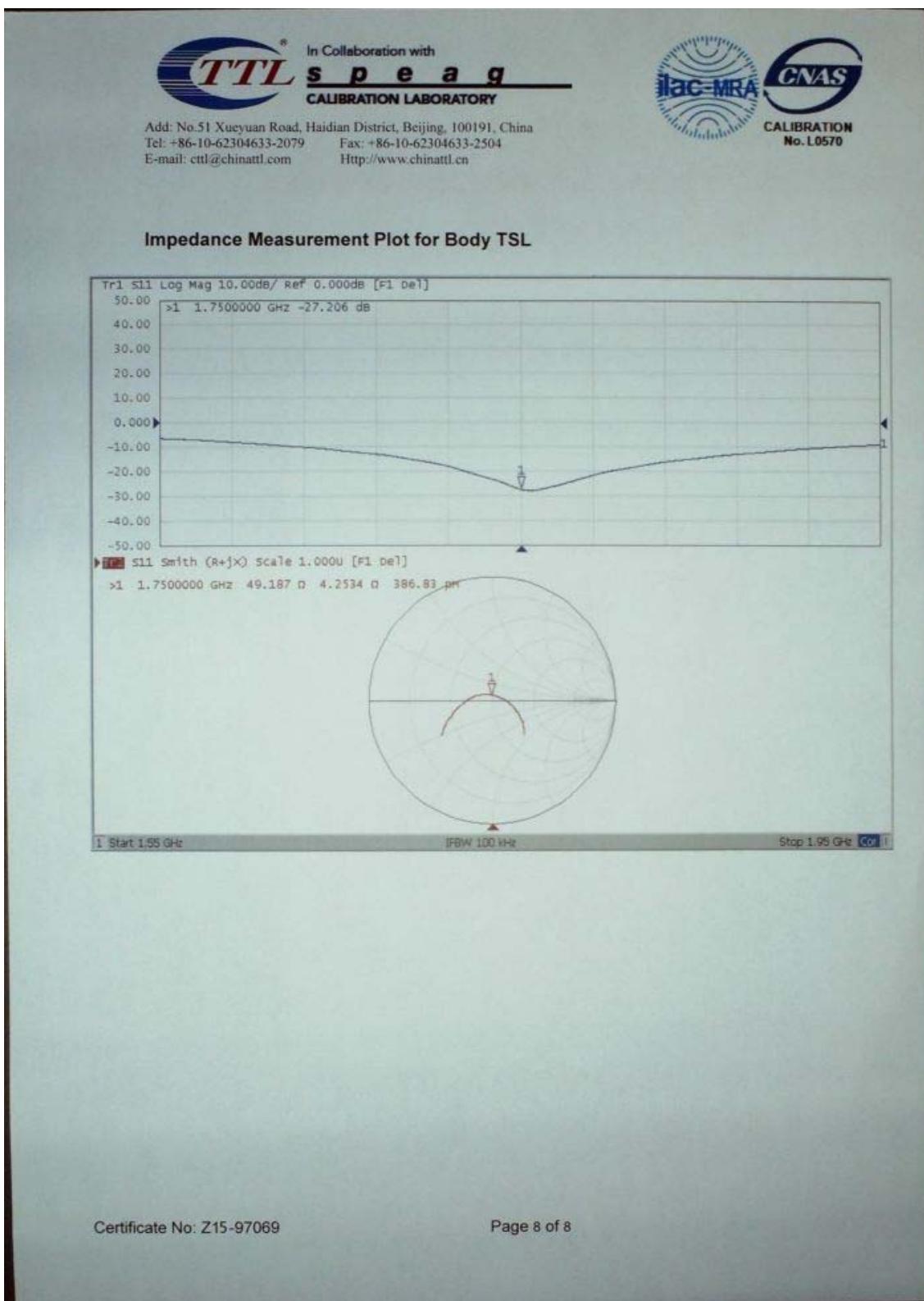
## Appendix A: Calibration Certificate



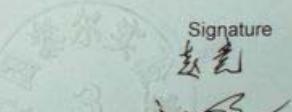
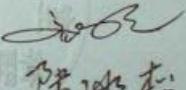
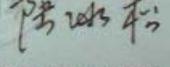
## Appendix A: Calibration Certificate

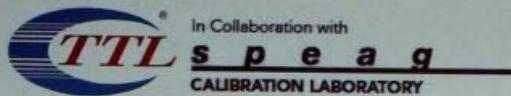


## Appendix A: Calibration Certificate



## 1.5. D2450V2 Dipole Calibration Certificate

 <b>In Collaboration with</b> <b>s p e a g</b> <b>CALIBRATION LABORATORY</b>		 <b>ILAC-MRA</b> <b>CNAS</b> <b>CALIBRATION</b> <b>No. L0570</b>	
Client	<b>CIQ-SZ(Auden)</b>		
<b>Certificate No: Z15-97070</b>			
<b>CALIBRATION CERTIFICATE</b>			
Object	D2450V2 - SN: 884		
Calibration Procedure(s)	TMC-OS-E-02-194 Calibration procedure for dipole validation kits		
Calibration date:	September 1, 2015		
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature(<math>22\pm3</math>)°C and humidity&lt;70%.</p> <p>Calibration Equipment used (M&amp;TE critical for calibration)</p>			
Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	102083	11-Sep-14 (TMC, No.JZ13-443)	Sep-15
Power sensor NRV-Z5	100595	11-Sep-14 (TMC, No. JZ13-443)	Sep-15
Reference Probe ES3DV3	SN 3149	5- Sep-14 (SPEAG, No.ES3-3149_Sep13)	Sep-15
DAE3	SN 536	23-Jan-15 (SPEAG, DAE3-536_Jan14)	Jan-16
Signal Generator E4438C	MY49070393	13-Nov-14 (TMC, No.JZ13-394)	Nov-15
Network Analyzer E8362B	MY43021135	19-Oct-14 (TMC, No.JZ13-278)	Oct-15
Calibrated by:	Name Zhao Jing	Function SAR Test Engineer	Signature 
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	
Issued: September 4, 2015			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			
Certificate No: Z15-97070		Page 1 of 8	



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Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504  
E-mail: [cttl@chinattl.com](mailto:cttl@chinattl.com) [Http://www.chinattl.com](http://www.chinattl.com)



**Glossary:**

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMLx,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, "Procedure to measure the Specific Absorption Rate (SAR) For hand-held devices used in close proximity to the ear (frequency range of 300MHz to 3GHz)", February 2005
- c) KDB865664, SAR Measurement Requirements for 100 MHz to 6 GHz

**Additional Documentation:**

- d) 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%.

## Appendix A: Calibration Certificate

 <p>In Collaboration with <b>s p e a g</b> CALIBRATION LABORATORY</p> <p>Add: No.51 Xueyuan Road, Haidian District, Beijing, 100191, China Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504 E-mail: <a href="mailto:ctl@chinattl.com">ctl@chinattl.com</a> <a href="http://www.chinattl.cn">Http://www.chinattl.cn</a></p>	 <p>ILAC-MRA CNAS CALIBRATION No. L0570</p>																																																																																						
<p><b>Measurement Conditions</b>            DASY system configuration, as far as not given on page 1.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">DASY Version</td> <td style="width: 33%;">DASY52</td> <td style="width: 33%;">52.8.8.1222</td> </tr> <tr> <td>Extrapolation</td> <td colspan="2">Advanced Extrapolation</td> </tr> <tr> <td>Phantom</td> <td colspan="2">Triple Flat Phantom 5.1C</td> </tr> <tr> <td>Distance Dipole Center - TSL</td> <td>10 mm</td> <td>with Spacer</td> </tr> <tr> <td>Zoom Scan Resolution</td> <td colspan="2">dx, dy, dz = 5 mm</td> </tr> <tr> <td>Frequency</td> <td colspan="2">2450 MHz ± 1 MHz</td> </tr> </table> <p><b>Head TSL parameters</b>            The following parameters and calculations were applied.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Temperature</th> <th>Permittivity</th> <th>Conductivity</th> </tr> </thead> <tbody> <tr> <td>Nominal Head TSL parameters</td> <td>22.0 °C</td> <td>39.2</td> <td>1.80 mho/m</td> </tr> <tr> <td>Measured Head TSL parameters</td> <td>(22.0 ± 0.2) °C</td> <td>40.2 ± 6 %</td> <td>1.84 mho/m ± 6 %</td> </tr> <tr> <td>Head TSL temperature change during test</td> <td>&lt;1.0 °C</td> <td>---</td> <td>---</td> </tr> </tbody> </table> <p><b>SAR result with Head TSL</b>  <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</td> <td style="width: 33%;">Condition</td> <td style="width: 33%;"> </td> </tr> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>13.1 mW / g</td> </tr> <tr> <td>SAR for nominal Head TSL parameters</td> <td>normalized to 1W</td> <td>52.1 mW /g ± 20.8 % (k=2)</td> </tr> <tr> <td>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</td> <td>Condition</td> <td> </td> </tr> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>6.17 mW / g</td> </tr> <tr> <td>SAR for nominal Head TSL parameters</td> <td>normalized to 1W</td> <td>24.6 mW /g ± 20.4 % (k=2)</td> </tr> </table> </p> <p><b>Body TSL parameters</b>            The following parameters and calculations were applied.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Temperature</th> <th>Permittivity</th> <th>Conductivity</th> </tr> </thead> <tbody> <tr> <td>Nominal Body TSL parameters</td> <td>22.0 °C</td> <td>52.7</td> <td>1.95 mho/m</td> </tr> <tr> <td>Measured Body TSL parameters</td> <td>(22.0 ± 0.2) °C</td> <td>51.3 ± 6 %</td> <td>2.00 mho/m ± 6 %</td> </tr> <tr> <td>Body TSL temperature change during test</td> <td>&lt;1.0 °C</td> <td>---</td> <td>---</td> </tr> </tbody> </table> <p><b>SAR result with Body TSL</b>  <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</td> <td style="width: 33%;">Condition</td> <td style="width: 33%;"> </td> </tr> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>13.1 mW / g</td> </tr> <tr> <td>SAR for nominal Body TSL parameters</td> <td>normalized to 1W</td> <td>51.6 mW /g ± 20.8 % (k=2)</td> </tr> <tr> <td>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</td> <td>Condition</td> <td> </td> </tr> <tr> <td>SAR measured</td> <td>250 mW input power</td> <td>6.11 mW / g</td> </tr> <tr> <td>SAR for nominal Body TSL parameters</td> <td>normalized to 1W</td> <td>24.2 mW /g ± 20.4 % (k=2)</td> </tr> </table> </p>		DASY Version	DASY52	52.8.8.1222	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			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	40.2 ± 6 %	1.84 mho/m ± 6 %	Head TSL temperature change during test	<1.0 °C	---	---	SAR averaged over 1 cm <sup>3</sup> (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	52.1 mW /g ± 20.8 % (k=2)	SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	Condition		SAR measured	250 mW input power	6.17 mW / g	SAR for nominal Head TSL parameters	normalized to 1W	24.6 mW /g ± 20.4 % (k=2)		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	51.3 ± 6 %	2.00 mho/m ± 6 %	Body TSL temperature change during test	<1.0 °C	---	---	SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition		SAR measured	250 mW input power	13.1 mW / g	SAR for nominal Body TSL parameters	normalized to 1W	51.6 mW /g ± 20.8 % (k=2)	SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	Condition		SAR measured	250 mW input power	6.11 mW / g	SAR for nominal Body TSL parameters	normalized to 1W	24.2 mW /g ± 20.4 % (k=2)
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Certificate No: Z15-97070

Page 3 of 8

## Appendix A: Calibration Certificate



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CALIBRATION  
No. L0570

### Appendix

#### Antenna Parameters with Head TSL

Impedance, transformed to feed point	58.3Ω- 0.76jΩ
Return Loss	- 22.3dB

#### Antenna Parameters with Body TSL

Impedance, transformed to feed point	58.1Ω+ 2.61jΩ
Return Loss	- 22.1dB

#### General Antenna Parameters and Design

Electrical Delay (one direction)	1.224 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.

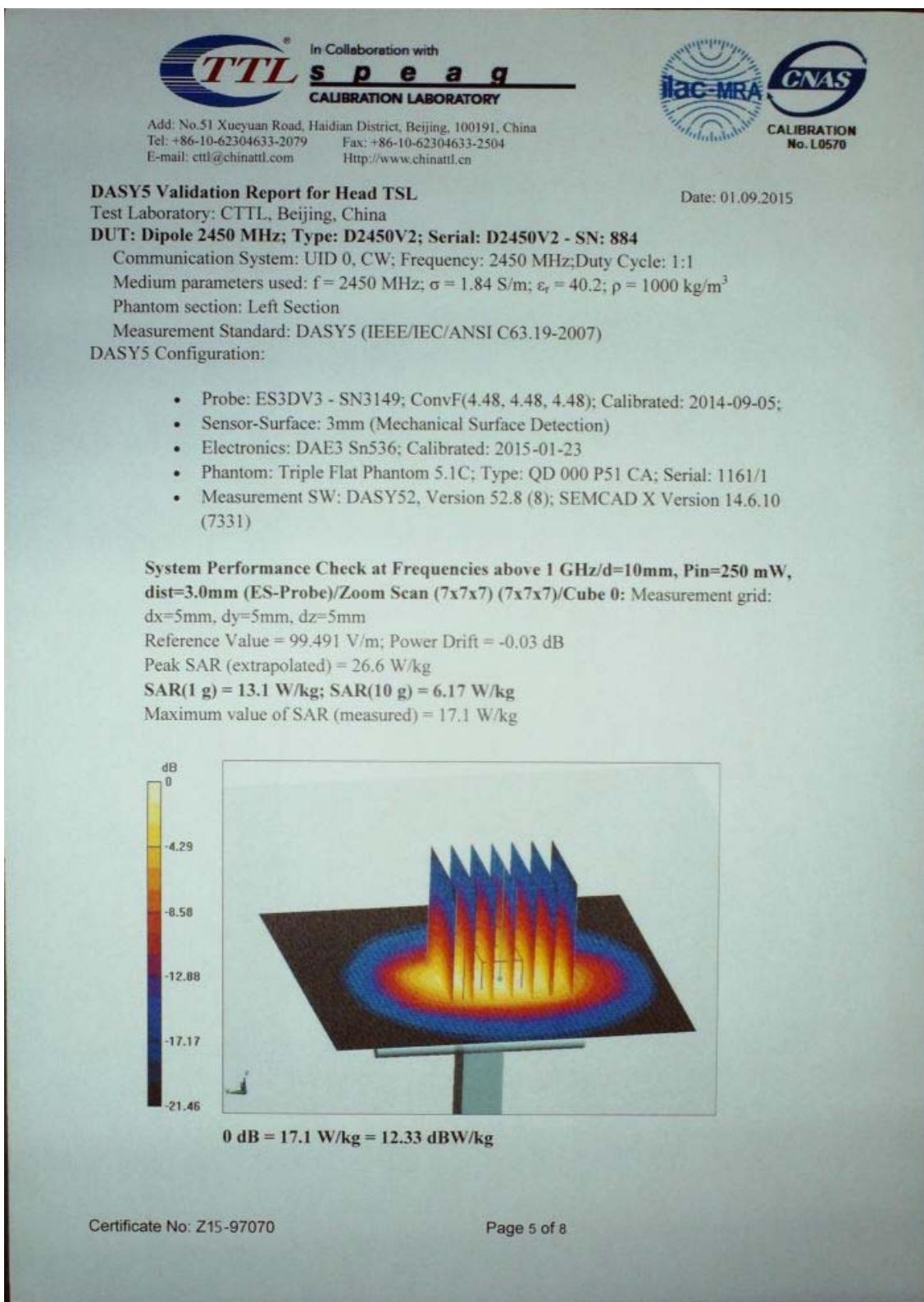
#### Additional EUT Data

Manufactured by	SPEAG
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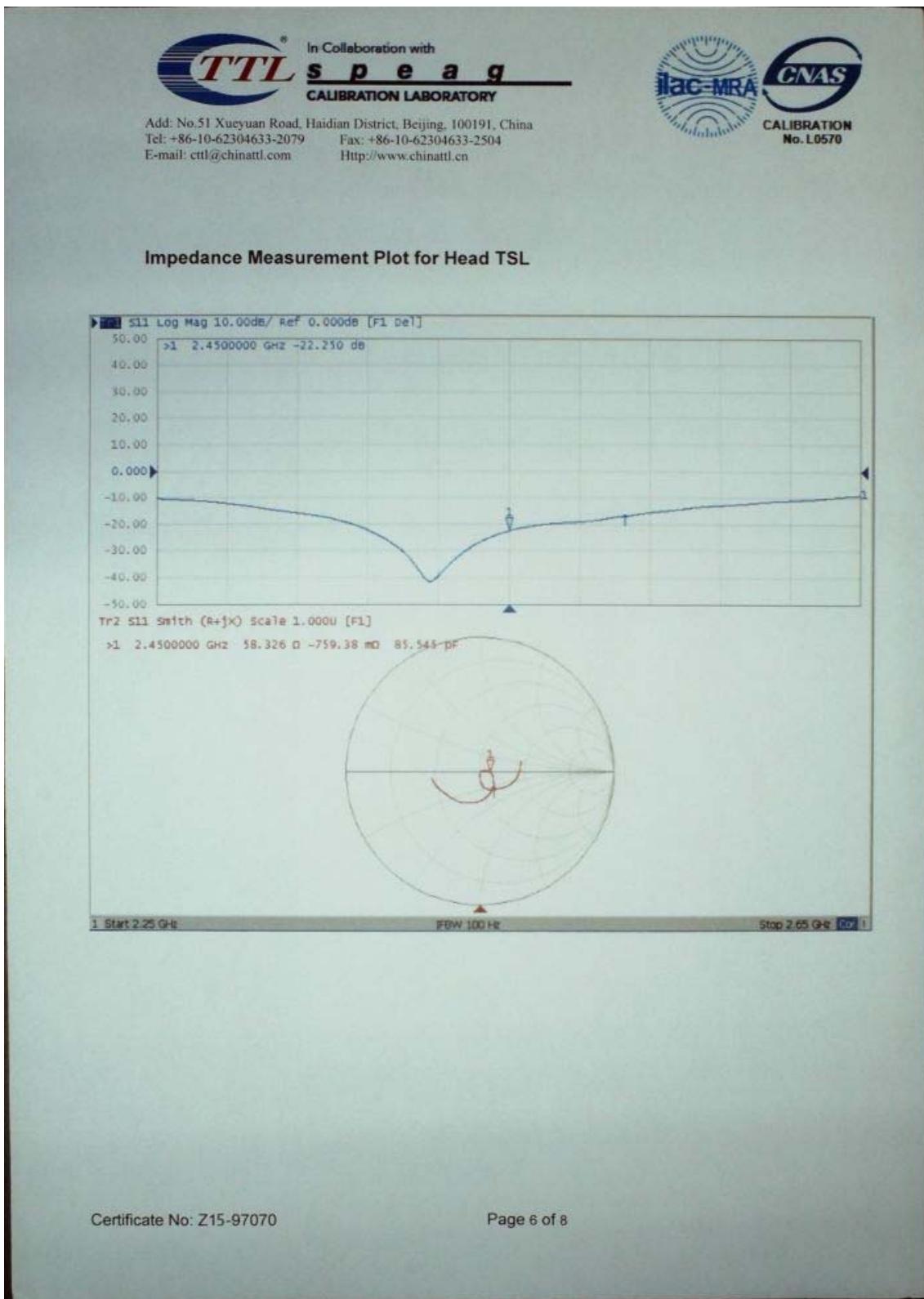
Certificate No: Z15-97070

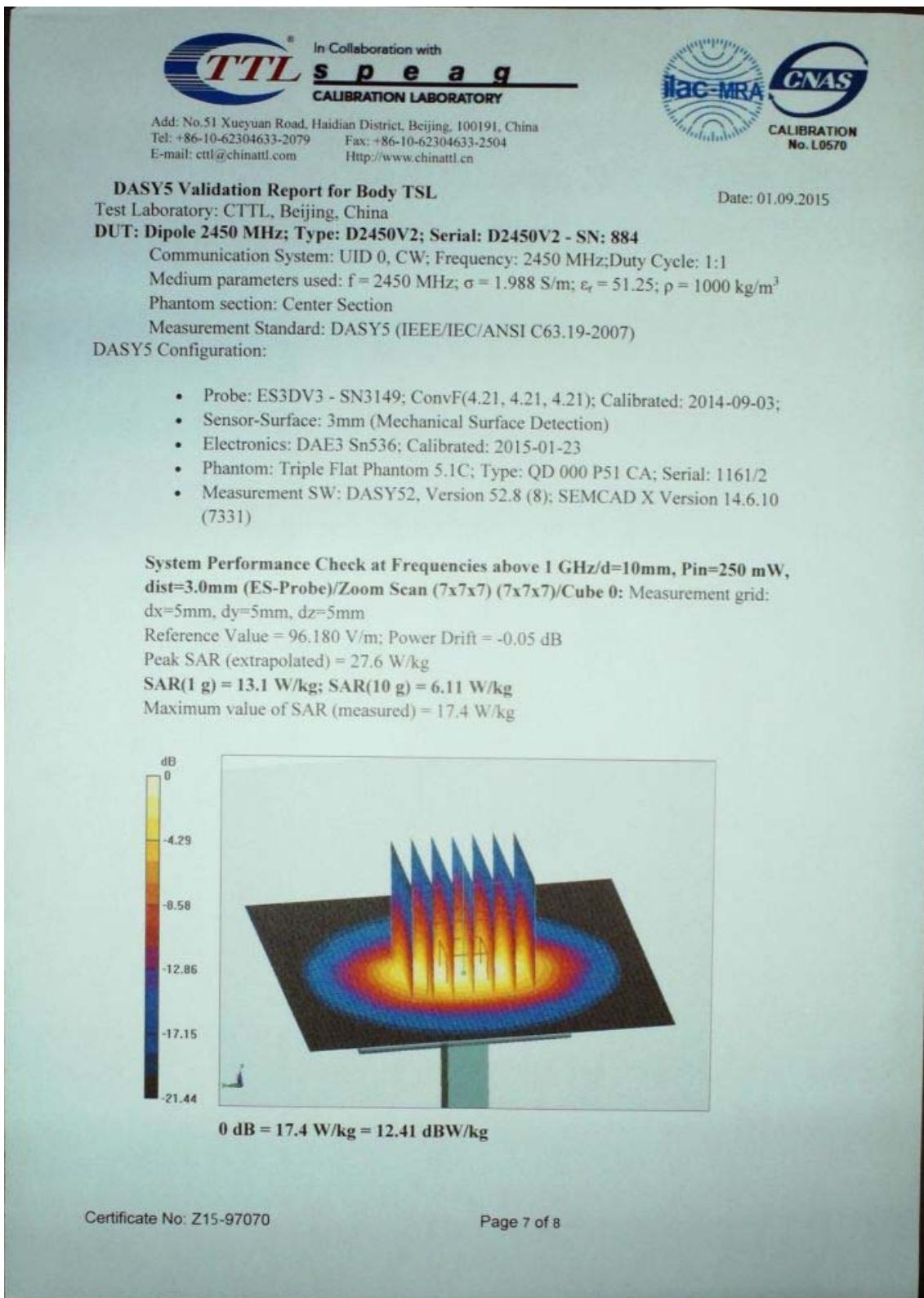
Page 4 of 8

## Appendix A: Calibration Certificate

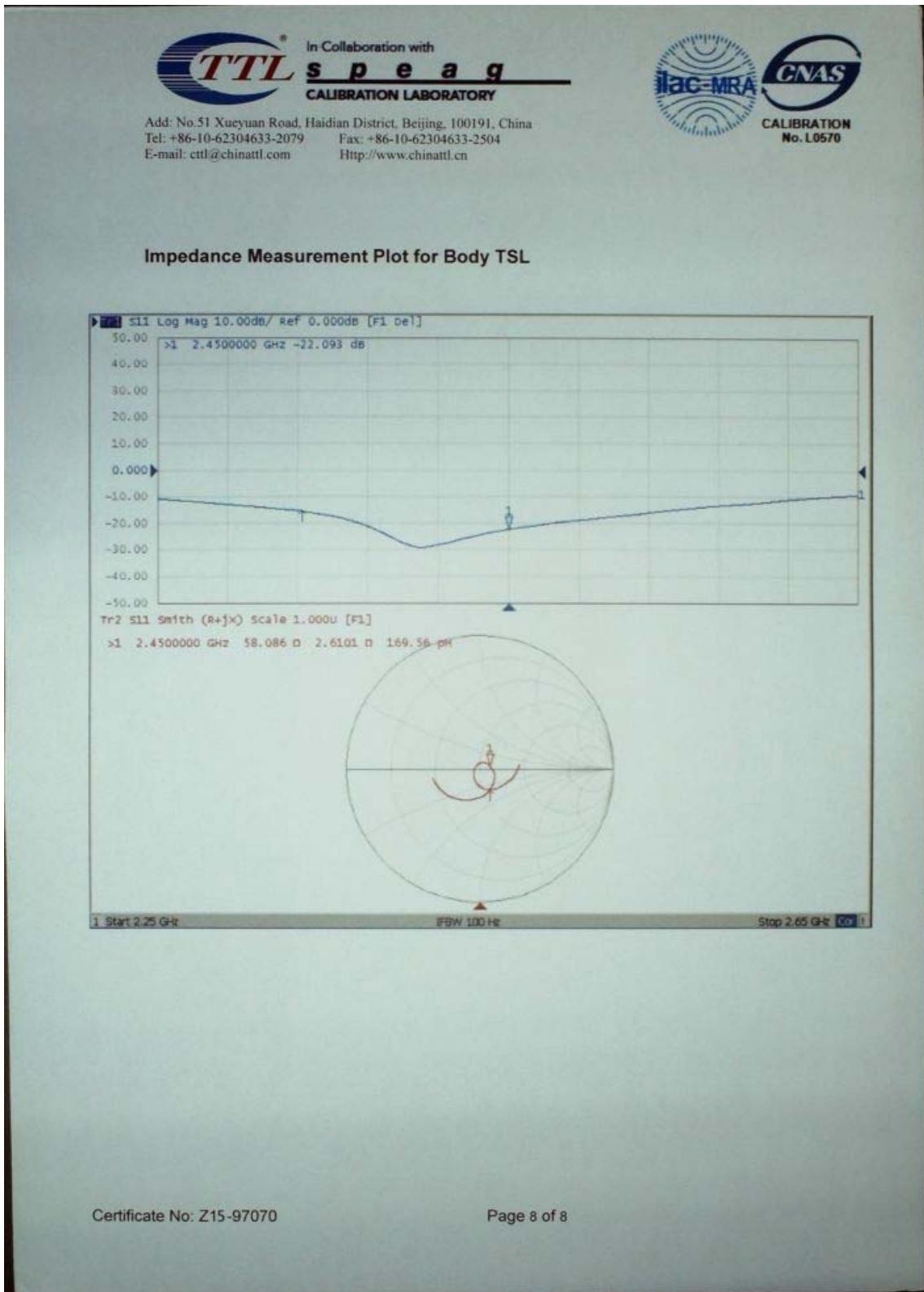


## Appendix A: Calibration Certificate

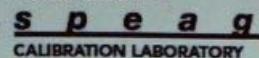
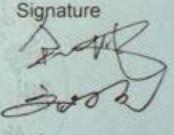
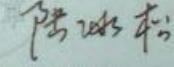
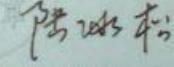




## Appendix A: Calibration Certificate



## 1.6. DAE4 Calibration Certificate

 <b>In Collaboration with</b>  <b>CALIBRATION LABORATORY</b>		  <b>CALIBRATION No. L0570</b>	
Client : <b>CIQ-SZ(Auden)</b>		<b>Certificate No: Z15-97066</b>	
<b>CALIBRATION CERTIFICATE</b>			
Object	DAE4 - SN: 1315		
Calibration Procedure(s)	<b>TMC-OS-E-01-198</b> Calibration Procedure for the Data Acquisition Electronics (DAEx)		
Calibration date:	July 22, 2015		
<p>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.</p> <p>All calibrations have been conducted in the closed laboratory facility: environment temperature(<math>22\pm3</math>)°C and humidity&lt;70%.</p>			
Calibration Equipment used (M&TE critical for calibration)			
Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Documenting Process Calibrator 753	1971018	01-July-15 (CTTL, No:J14X02147)	July-16
Calibrated by: Yu Zongying	Name Yu Zongying	Function SAR Test Engineer	    
Reviewed by: Qi Dianyuan			
Approved by: Lu Bingsong		Deputy Director of the laboratory	
			Issued: July 23, 2015
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			
Certificate No: Z15-97066		Page 1 of 3	



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**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 report provide only calibration results for DAE, it does not contain other performance test results.

Certificate No: Z15-97066

Page 2 of 3

## Appendix A: Calibration Certificate



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E-mail: ctll@chinattl.com Http://www.chinattl.cn



CALIBRATION  
No. L0570

### DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB =  $6.1\mu V$ , full range =  $-100...+300 mV$   
Low Range: 1LSB =  $61nV$ , full range =  $-1.....+3mV$

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

Calibration Factors	X	Y	Z
High Range	$405.162 \pm 0.15\% (k=2)$	$405.006 \pm 0.15\% (k=2)$	$404.963 \pm 0.15\% (k=2)$
Low Range	$3.99072 \pm 0.7\% (k=2)$	$3.98481 \pm 0.7\% (k=2)$	$3.98836 \pm 0.7\% (k=2)$

### Connector Angle

Connector Angle to be used in DASY system	$22^\circ \pm 1^\circ$
---	------------------------

Certificate No: Z15-97066

Page 3 of 3

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