

APPENDIX D: RELEVANT PAGES FROM DIPOLE VALIDATION KIT REPORT(S)

The State Radio_monitoring_center Testing Center	
Calibration Certificate	
	
Instrument	Dipole
Type/Model	D900V2
Manufacturer	Schmid & Partner Engineering AG
Serial No	SN:171
Name of Client	The State Radio_monitoring_center Testing Center
Address of Client	No.98 Bei Lishi Road XiCheng District
Calibration Date	2010.6.11
All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3) °C and humidity<70%	
Approved by	 
Tel: +86-10-68009202 68009203 Fax: +86-10-68009205 68009195 Add: No.80 Bei Lishi Road, Xi Cheng District Beijing 100037, P.R.China	
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The State Radio_monitoring_center Testing Center

Reference documents of the measurement(Code, Name)	
SRTC3003-V1.0.0 Working procedure for calibration of SAR Testing system	
Place and environmental condition of the measurement	
Temperature 21.6℃	Humidity 30.7%
Location SRTC Room226	

Primary Calibration Equipment used	Model/Type	ID#	Cal Date	Scheduled Calibration
Power meter	E4417A	SN: MY45101004	2009.8	2010.8
Power sensor	E9300B	SN: MY41496001	2009.8	2010.8
Power sensor	E9300B	SN: MY41496003	2009.8	2010.8
Reference DAE	DAE4	SN: 720	2010.1	2011.1
Reference probe	ES3DV3	SN: 3128	2009.6	2010.6
Secondary Calibration Equipment used	Model/Type	ID#	Cal Date	Scheduled Calibration
Signal generator	SML03	SN:103514	2009.8	2010.8
Network analyzer	8714ET	SN:US40372083	2009.8	2010.8

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The State Radio_monitoring_center Testing Center

Note:

1. 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.
2. This calibration certificate is not permitted to be reproduced except in full without written the approval of the only laboratory
3. SRTC is responsible for the whole of certificate only with stamp of SRTC.
4. The calibration results would be valid only for the items calibration.
5. The certification is written by Chinese and English. Exact meaning should be explained only on Chinese version.

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The State Radio_monitoring_center Testing Center

Glossary

TSL	Tissue Simulating Liquid
ConvF	The sensitivity of the TSL / sensitivity in TSL/NORM x, y, z
N/A	not applicable or not measured

Calibration is preformed according to the Following Standards

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in Human Head from Wireless Communication Devices: Measurement Techniques", December 2003
- 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) Federal Communication Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- e) DASY System Handbook

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The State Radio_monitoring_center Testing Center

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.
- 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.

Measurement Conditions

DASY Version	DSAY 5	V5.0 Build 126
Extrapolation	Advanced Extrapolation	——
Phantom	ELI4	——
Distance Dipole Center-TSL	15mm	With spacer (See note)
Area Scan Resolution	dx,dy=15mm	——
Zoom Scan Resolution	dx,dy,dz=5mm	——
Frequency	900MHz	——

Note: As client can not provide a spacer for their dipole, we used a alternate method to define the distance from dipole center to TSL. Pictures in Annex 3 show the details.

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Head TSL Parameters

The following parameters and calculation were applied

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0°C	41.5	0.97mho/m
Measured Head TSL parameters	(22±0.5)°C	41.2	0.95m±5%
Head TSL temperature during test	(21.6±0.6)°C	——	——

1. SAR-Head TSL

SAR -1g	Condition	——
SAR averaged over 1cm ³ (1g) of Head TSL		
SAR measured	250mW input power	2.70mW/g
SAR normalized	normalized to 1W	10.80mW/g
SAR for nominal Head TSL parameters	normalized to 1W	10.71 mW/g±15.20% (k=2)

SAR-10g	Condition	——
SAR averaged over 10cm ³ (10g) of Head TSL		
SAR measured	250mW input power	1.72mW/g
SAR normalized	normalized to 1W	6.88mW/g
SAR for nominal Head TSL parameters	normalized to 1W	6.80mW/g±14.38% (k=2)

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The State Radio_monitoring_center Testing Center

2. Annex

Annex 1

Date/Time: 6/11/2010 8:30:47 AM

Test Laboratory: SRTC, Beijing, China

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:171

Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 900$ MHz; $\sigma = 0.949$ mho/m; $\epsilon_r = 41.2$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)
DASY4 Configuration:

- Probe: ES3DV3 - SN3128; ConvF(5.52, 5.52, 5.52); Calibrated: 6/22/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn720; Calibrated: 1/18/2010
- Phantom: ELI 4.0; Type: QDOVA001BA
- Measurement SW: DASY5, V5.0 Build 126; SEMCAD X Version 13.4 Build 125

Pin=250mW; d=15mm /Zoom Scan (7x7x7) (7x7x7)/Cube 0:

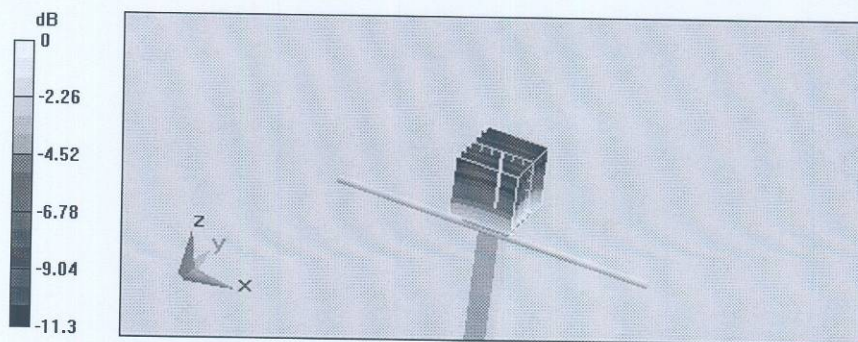
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.3 V/m; Power Drift = -0.025 dB

Peak SAR (extrapolated) = 4.18 W/kg

SAR(1 g) = 2.7 mW/g; SAR(10 g) = 1.72 mW/g

Maximum value of SAR (measured) = 2.93 mW/g



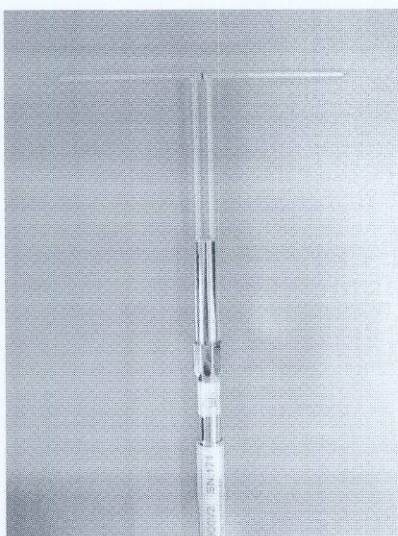
0 dB = 2.93mW/g

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The State Radio_monitoring_center Testing Center

Annex 2



Calibrated by 张明远

Checked by 刘翔

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



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

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- 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 300 MHz to 3 GHz)", February 2005
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	40.4 $\pm$ 6 %	0.88 mho/m $\pm$ 6 %
Head TSL temperature during test	(22.0 $\pm$ 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.37 mW / g
SAR normalized	normalized to 1W	9.48 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	9.46 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.56 mW / g
SAR normalized	normalized to 1W	6.24 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	6.21 mW / g $\pm$ 16.5 % (k=2)

¹ Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Body TSL parameters

The following parameters and calculations were applied.

	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	53.4 ± 6 %	0.99 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.42 mW / g
SAR normalized	normalized to 1W	9.68 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	9.36 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.60 mW / g
SAR normalized	normalized to 1W	6.40 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	6.24 mW / g ± 16.5 % (k=2)

² Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.9 Ω - 2.6 j Ω
Return Loss	-25.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.3 Ω - 4.5 j Ω
Return Loss	- 27.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.390 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.

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
Manufactured on	July 04, 2005

DASY4 Validation Report for Head TSL

Date/Time: 16.06.2008 10:59:00

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d023

Communication System: CW-835; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: HSL 900 MHz;

Medium parameters used: $f = 835$ MHz; $\sigma = 0.88$ mho/m; $\epsilon_r = 40.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(5.97, 5.97, 5.97); Calibrated: 28.04.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 14.03.2008
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

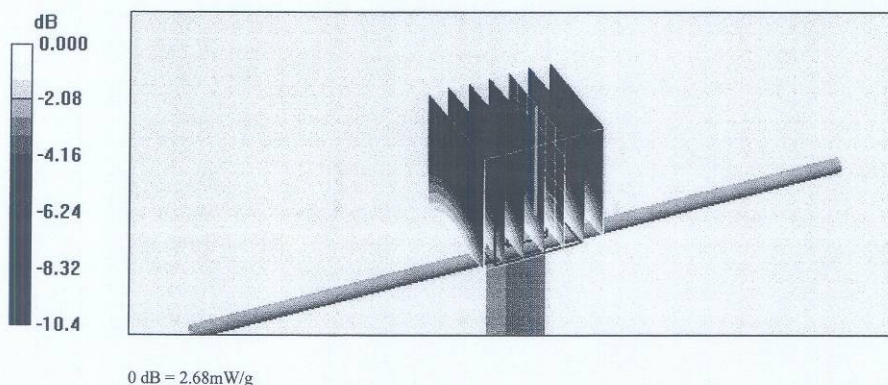
Pin=250mW; dip=15mm; dist=3.4mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.5 V/m; Power Drift = -0.056 dB

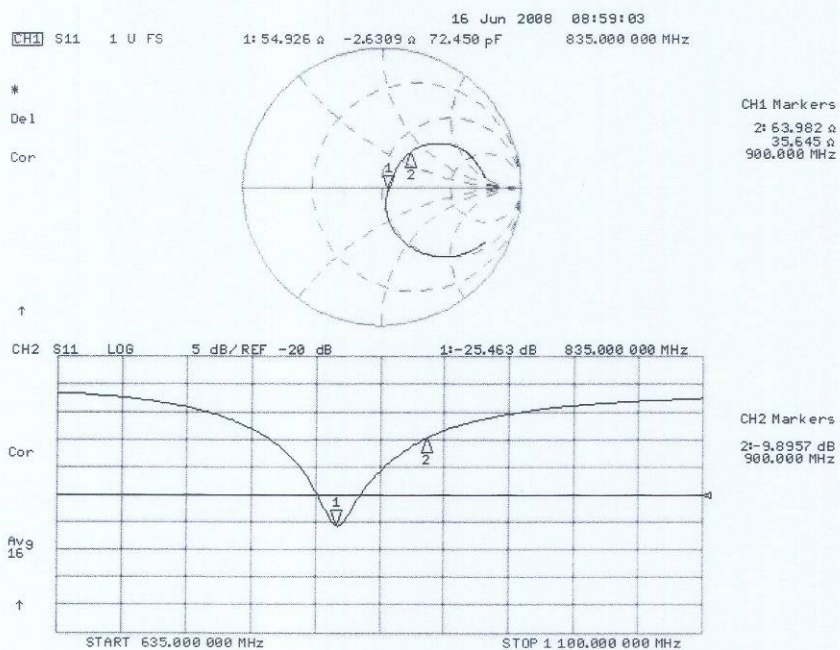
Peak SAR (extrapolated) = 3.48 W/kg

SAR(1 g) = 2.37 mW/g; SAR(10 g) = 1.56 mW/g

Maximum value of SAR (measured) = 2.68 mW/g



Impedance Measurement Plot for Head TSL



DASY4 Validation Report for Body TSL

Date/Time: 06.06.2008 12:44:11

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d023

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: MSL900;

Medium parameters used: $f = 835$ MHz; $\sigma = 0.99$ mho/m; $\epsilon_r = 53.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(5.9, 5.9, 5.9); Calibrated: 28.04.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 14.03.2008
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; ;
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

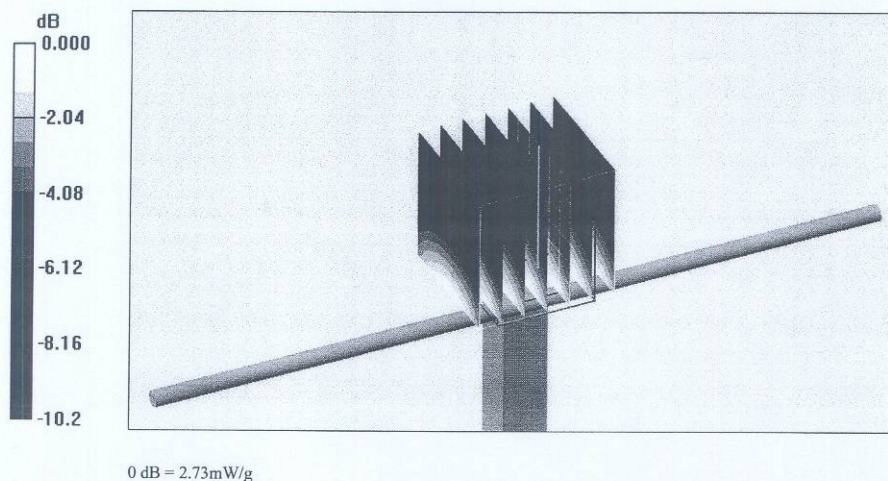
Pin = 250mW, d = 15mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 53.7 V/m; Power Drift = 0.008 dB

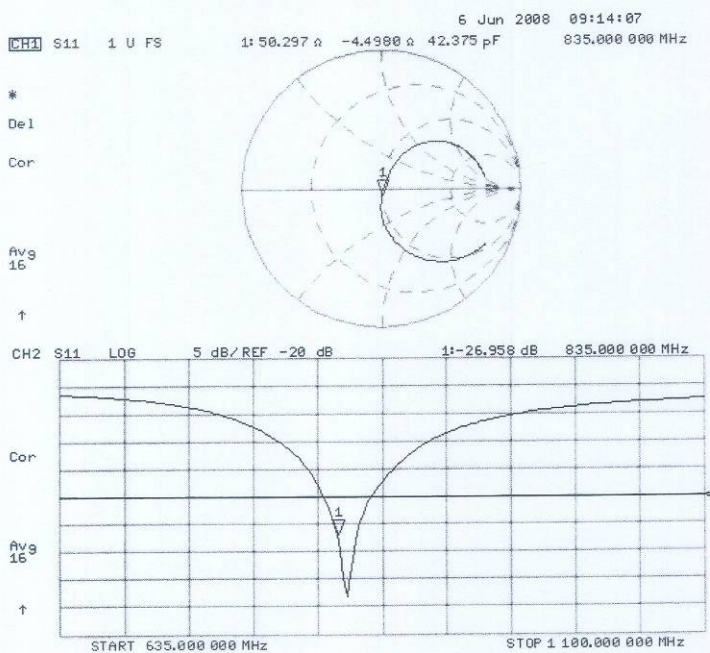
Peak SAR (extrapolated) = 3.49 W/kg

SAR(1 g) = 2.42 mW/g; SAR(10 g) = 1.6 mW/g

Maximum value of SAR (measured) = 2.73 mW/g



Impedance Measurement Plot for Body TSL



The State Radio_monitoring_center Testing Center

Calibration Certificate



Instrument Dipole

Type/Model D1800V2

Manufacturer Schmid & Partner Engineering AG

Serial No SN:2d084

Name of Client The State Radio_monitoring_center Testing Center

Address of Client No.98 Bei Lishi Road XiCheng District

Calibration Date 2010.6.11

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

Approved by



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The State Radio_monitoring_center Testing Center

Reference documents of the measurement(Code, Name)	
SRMC3003-V1.0.0 Working procedure for calibration of SAR Testing system	
Place and environmental condition of the measurement	
Temperature 21.6℃	Humidity 30.7%
Location SRTC Room226	

Primary Calibration Equipment used	Model/Type	ID#	Cal Date	Scheduled Calibration
Power meter	E4417A	SN: MY45101004	2009.8	2010.8
Power sensor	E9300B	SN: MY41496001	2009.8	2010.8
Power sensor	E9300B	SN: MY41496003	2009.8	2010.8
Reference DAE	DAE4	SN: 720	2010.1	2011.1
Reference probe	ES3DV3	SN: 3128	2009.6	2010.6

Secondary Calibration Equipment used	Model/Type	ID#	Cal Date	Scheduled Calibration
Signal generator	SML03	SN:103514	2009.8	2010.8
Network analyzer	8714ET	SN:US40372083	2009.8	2010.8

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The State Radio_monitoring_center Testing Center

Note:

1. 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.
2. This calibration certificate is not permitted to be reproduced except in full without written the approval of the only laboratory
3. SRTC is responsible for the whole of certificate only with stamp of SRTC.
4. The calibration results would be valid only for the items calibration.
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The State Radio_monitoring_center Testing Center

Glossary

TSL	Tissue Simulating Liquid
ConvF	The sensitivity of the TSL / sensitivity in TSL/NORM x, y, z
N/A	not applicable or not measured

Calibration is preformed according to the Following Standards

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in Human Head from Wireless Communication Devices: Measurement Techniques", December 2003
- 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) Federal Communication Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- e) DASY System Handbook

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The State Radio_monitoring_center Testing Center

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.
- 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.

Measurement Conditions

DASY Version	DSAY 5	V5.0 Build 126
Extrapolation	Advanced Extrapolation	———
Phantom	ELI4	———
Distance Dipole Center-TSL	10mm	With spacer (See note)
Area Scan Resolution	dx,dy=10mm	———
Zoom Scan Resolution	dx,dy,dz=5mm	———
Frequency	1800MHz	———

Note: As client can not provide a spacer for their dipole, we used a alternate method to define the distance from dipole center to TSL. Pictures in Annex 3 show the details.

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The State Radio_monitoring_center Testing Center

Head TSL Parameters

The following parameters and calculation were applied

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0°C	40.0	1.40mho/m
Measured Head TSL parameters	(22±0.5)°C	39.2	1.35m±5%
Head TSL temperature during test	(21.6±0.6)°C	——	——

1. SAR-Head TSL

SAR -1g SAR averaged over 1cm ³ (1g) of Head TSL	Condition	——
SAR measured	250mW input power	9.55mW/g
SAR normalized	normalized to 1W	38.20mW/g
SAR for nominal Head TSL parameters	normalized to 1W	37.62 mW/g±15.20%(k=2)

SAR-10g SAR averaged over 10cm ³ (10g) of Head TSL	Condition	——
SAR measured	250mW input power	5.09mW/g
SAR normalized	normalized to 1W	20.36mW/g
SAR for nominal Head TSL parameters	normalized to 1W	20.13mW/g±14.38%(k=2)

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The State Radio_monitoring_center Testing Center

2. Annex

Annex 1

Date/Time: 6/11/2010 8:30:47 AM

Test Laboratory: SRTC, Beijing, China

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 - SN: 2d084

Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1800$ MHz; $\sigma = 1.35$ mho/m; $\epsilon_r = 39.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY4 Configuration:

- Probe: ES3DV3 - SN3128; ConvF(4.93, 4.93, 4.93); Calibrated: 6/22/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn720; Calibrated: 1/18/2010
- Phantom: ELI 4.0; Type: QDOVA001BA
- Measurement SW: DASY5, V5.0 Build 126; SEMCAD X Version 13.4 Build 125

Pin=250mW;d=10mm/Zoom Scan (7x7x7) (7x7x7)/Cube 0:

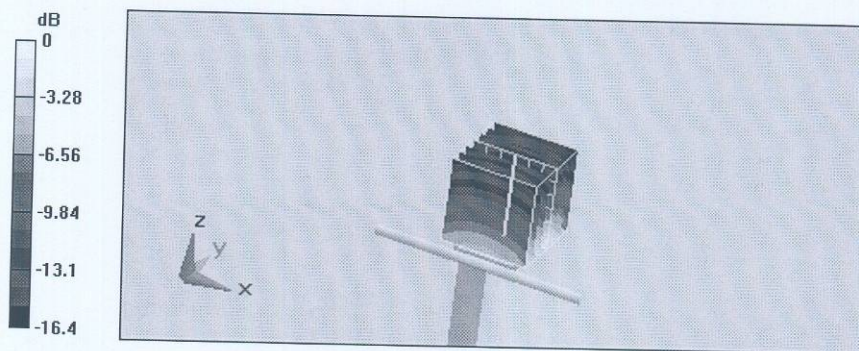
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 89 V/m; Power Drift = -0.119 dB

Peak SAR (extrapolated) = 17.2 W/kg

SAR(1 g) = 9.55 mW/g; SAR(10 g) = 5.09 mW/g

Maximum value of SAR (measured) = 10.7 mW/g



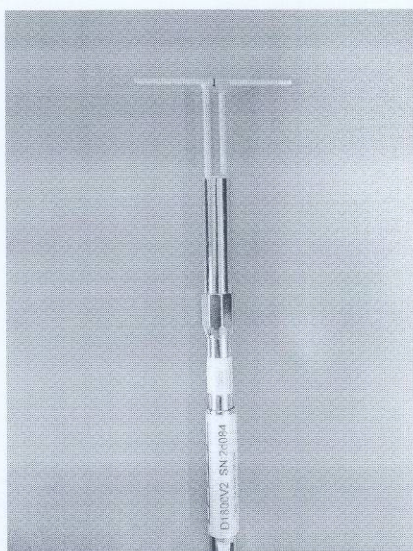
0 dB = 10.7mW/g

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The State Radio_monitoring_center Testing Center

Annex 2



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