APPENDIX D: RELEVANT PAGES FROM DAE REPORT(S)

The State Radio_monitoring_center Testing Center

Calibration Certificate

CALIBRATION
CNAS L0447

Instrument	DAE
Type/Model	DAE4
Manufacturer	Schmid & Partner Engineering AG
Serial No	SN:720
Name of Client	The State Radio_monitoring_center Testing Center
Address of Client	No.98 Bei Lishi Road XiCheng District
Calibration Date	2012.2.7

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

Approved by

国家无线电监测中心检测中心
校准报告专用章

Tel: +86-10-68009202 68009203 Fax: +86-10-68009205 68009195
Add: No.80 Bei Lishi Road, Xi Cheng District Beijing 100037, P .R .China

Page 1 of 7 Certificate No.SRTC2012-CAL001-001

The State Radio_monitoring_center Testing Center

Reference documents of the measurement(Code, Name)
SRTC3003-V1.0.0 Working procedure for calibration——SAR testing system
Place and environmental condition of the measurement
Temperature 21.9℃ Humidity 27.8% Location SRTC226 room

Primary Calibration Equipment used	Model/Type	ID#	Cal Date	Scheduled Calibration
Process Calibrator	Fluke 525B	1090118	2011.8	2012.8
Protractor		1001	2011.8	2012.8
Secondary Calibration Equipment used	Model/Type	ID#	Cal Date	Scheduled Calibration
Calibrator Box	V1.1	1003	---	---

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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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Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system

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

Methods Applied and Interpretation of Parameters

- **DC Voltage Measurement**: Calibration Factor assessed for use in DASY system by comparison with a calibrates instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- **Connector angle**: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters contain technical information as a result from the performance test and require no uncertainty.

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DC Voltage Measurement Linearity: Verification of the Linearity at +10% and -10% of the nominal calibration voltage.

Common mode sensitivity: Influence of a positive or negative common mode voltage on the differential measurement.

Channel separation: Influence of a voltage on the neighbor channels not subject to an input voltage.

AD Converter Values with inputs shorted: Values on the internal AD converter corresponding to zero input voltage.

Input Offset Measurement: Output voltage and statistical results over a large number of zero voltage measurement.

DC Voltage Measurement

A/D-Converter Resolution nominal

High Range: 1LSB=6.1 μ V full range = -100…+300mV

Low Range: 1LSB=61nV full range = -1...+3mV

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

Calibration Facto	X	Y	Z
High Range	403.358±0.12%(k =2)	404.816±0.12%(k =2)	403.239±0.12%(k =2)
Low Range	3.948±1.3%(k =2)	3.965±1.3%(k =2)	3.950±1.3%(k =2)

Connector Angle

Connector Angle to be used in DASY system	174° ±1°

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1. DC Voltage Linearity

DC Voltage Linearity

High Range	Input (μ V)	Reading(μ V)	Error(%)
Channel X +Input	+200000	200001.6	0.001
Channel X +Input	+20000	20008.9	0.045
Channel X -Input	-20000	-19997.9	0.011
Channel Y +Input	+200000	200001.1	0.000
Channel Y +Input	+20000	20009.2	0.046
Channel Y -Input	-20000	-19996.7	0.017
Channel Z +Input	+200000	200002.5	0.001
Channel Z +Input	+20000	20006.1	0.031
Channel Z -Input	-20000	-20004.4	0.022

Low Range	Input (μ V)	Reading(μ V)	Error(%)
Channel X +Input	+2000	2000.5	0.03
Channel X +Input	+200	201.6	0.80
Channel X -Input	-200	-201.9	0.95
Channel Y +Input	+2000	2000.3	0.02
Channel Y +Input	+200	201.6	0.80
Channel Y -Input	-200	-201.9	0.95
Channel Z +Input	+2000	1999.0	0.05
Channel Z +Input	+200	200.2	0.10
Channel Z -Input	-200	-201.5	0.75

2 .Common mode sensitivity

Common mode sensitivity

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

	Common mode Input Voltage(mV)	High Range Average Reading(μ V)	Low Range Average Reading(μ V)
Channel X	200	-5.6	-7.0
	-200	9.1	8.1
Channel Y	200	15.7	15.1
	-200	-15.8	-15.6
Channel Z	200	-17.2	-17.4
	-200	15.6	15.7

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3 .Channel separation

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

	Input Voltage(mV)	Channel X(μV)	Channel Y(μV)	Channel Z(μV)
Channel X	200	——	9.6	4.0
Channel Y	200	7.4	——	9.7
Channel Z	200	6.8	6.7	——

4 .AD-Converter Values with inputs shorted

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

	High Range(LSB)	Low Range (LSB)
Channel X	16150.2	16332.3
Channel Y	16218.4	17543.7
Channel Z	16450.4	15098.6

5 .Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3sec
Input 10MΩ

	Average(μV)	Min. Offset(μV)	Max. Offset(μV)	Std.Deviation(μV)
Channel X	0.2	1.5	-1.3	0.5
Channel Y	-0.6	1.7	-1.7	0.4
Channel Z	-0.8	1.5	-2.4	0.7

Calibrated by 张林伟 Checked by 刘佳

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

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

Client SRTC (PTT)

Certificate No: D835V2-4d023_Oct11

CALIBRATION CERTIFICATE

Object: D835V2 - SN: 4d023

Calibration procedure(s): QA CAL-05.v8
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: October 17, 2011

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	29-Apr-11 (No. ES3-3205_Apr11)	Apr-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: November 29, 2011

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: D835V2-4d023_Oct11 Page 1 of 8

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:

a) 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
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 300 MHz to 3 GHz)", February 2005
c) 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:

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.

Measurement Conditions

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

DASY Version	DASY5	V52.6.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.3 ± 6 %	0.89 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.31 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**9.31 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.51 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**6.08 mW /g ± 16.5 % (k=2)**

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	53.5 ± 6 %	0.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.40 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**9.39 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.58 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**6.21 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.6 Ω - 3.5 jΩ
Return Loss	- 26.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.2 Ω - 3.9 jΩ
Return Loss	- 28.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.393 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	December 17, 2004

DASY5 Validation Report for Head TSL

Date: 17.10.2011

Test Laboratory: SPEAG, Zurich, Switzerland

D835_4d023_H_111017_JK

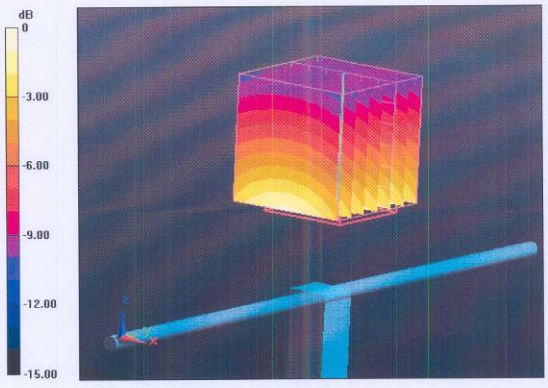
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d023

Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.89 mho/m; ε_r = 41.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

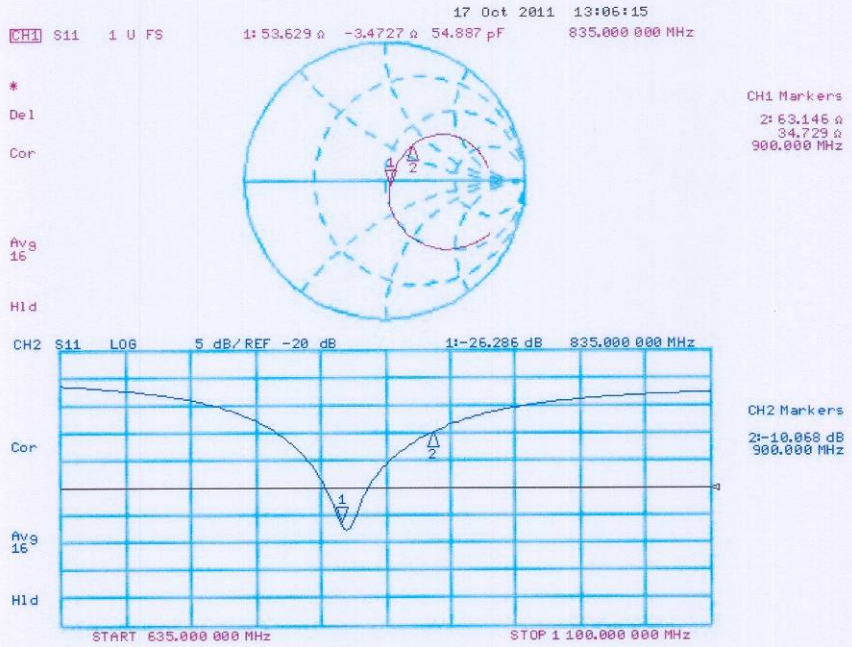
- Probe: ES3DV3 - SN3205; ConvF(6.07, 6.07, 6.07); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.835 V/m; Power Drift = 0.0017 dB
Peak SAR (extrapolated) = 3.399 W/kg
SAR(1 g) = 2.31 mW/g; SAR(10 g) = 1.51 mW/g
Maximum value of SAR (measured) = 2.692 mW/g



0 dB = 2.690mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 17.10.2011

Test Laboratory: SPEAG, Zurich, Switzerland

D835_4d023_M_111017_JK

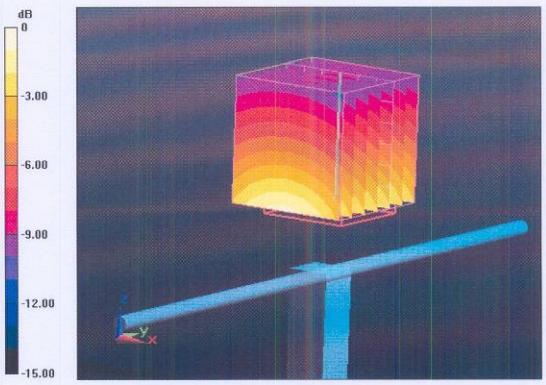
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d023

Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.99 mho/m; ε_r = 53.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.02, 6.02, 6.02); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.106 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 3.477 W/kg
SAR(1 g) = 2.4 mW/g; SAR(10 g) = 1.58 mW/g
Maximum value of SAR (measured) = 2.801 mW/g



0 dB = 2.800mW/g

Impedance Measurement Plot for Body TSL