

SNSTC's Capacities and Practices on Performance Testing for Nuclear Security System and Equipment



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State Nuclear Security Technology Center (SNSTC)

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Outlines

- 1. Introduction of SNSTC**
- 2. Capacities and Qualifications on Performance Testing**
- 3. Practices and Cases**
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1. Introduction of SNSTC

The State Nuclear Security Technology Center (SNSTC) was established with the approval of the Chinese central government in November 2011. As an affiliate to China Atomic Energy Authority (CAEA), SNSTC' primary mission includes:

- Provide technical support for government management on nuclear security
- Provide technical support for nuclear material accounting and control
- Provide technical support for nuclear export & import control and nonproliferation;
- Technical exchange and international cooperation in nuclear security areas;
- Construction, operation and management of Center of Excellence (COE) on Nuclear Security in China.



1. Introduction of SNSTC



A1

展示培训楼
DEMONSTRATION
& TRAINING BUILDING

A2

学员食堂
CAFETERIA

A3

学员宿舍
DORMITORY

A4

学术报告厅
AUDITORIUM

B1

响应力量训练及演练设施
RESPONSE FORCE
TRAINING AND EXERCISE FACILITY

B2

测试水池
TEST POOL

C1

出入口控制设施
ACCESS CONTROL
FACILITY

C2

模拟核材料库
MOCK NUCLEAR
MATERIAL BUNKER

C3

核材料衡算与控制综合培训设施
INTEGRATED TRAINING FACILITY FOR NUCLEAR
MATERIAL ACCOUNTING & CONTROL

D1

绿地
GREEN FIELD

E1

分析实验楼
ANALYTICAL
LABORATORY

E2

环境试验楼
ENVIRONMENTAL TEST
LABORATORY

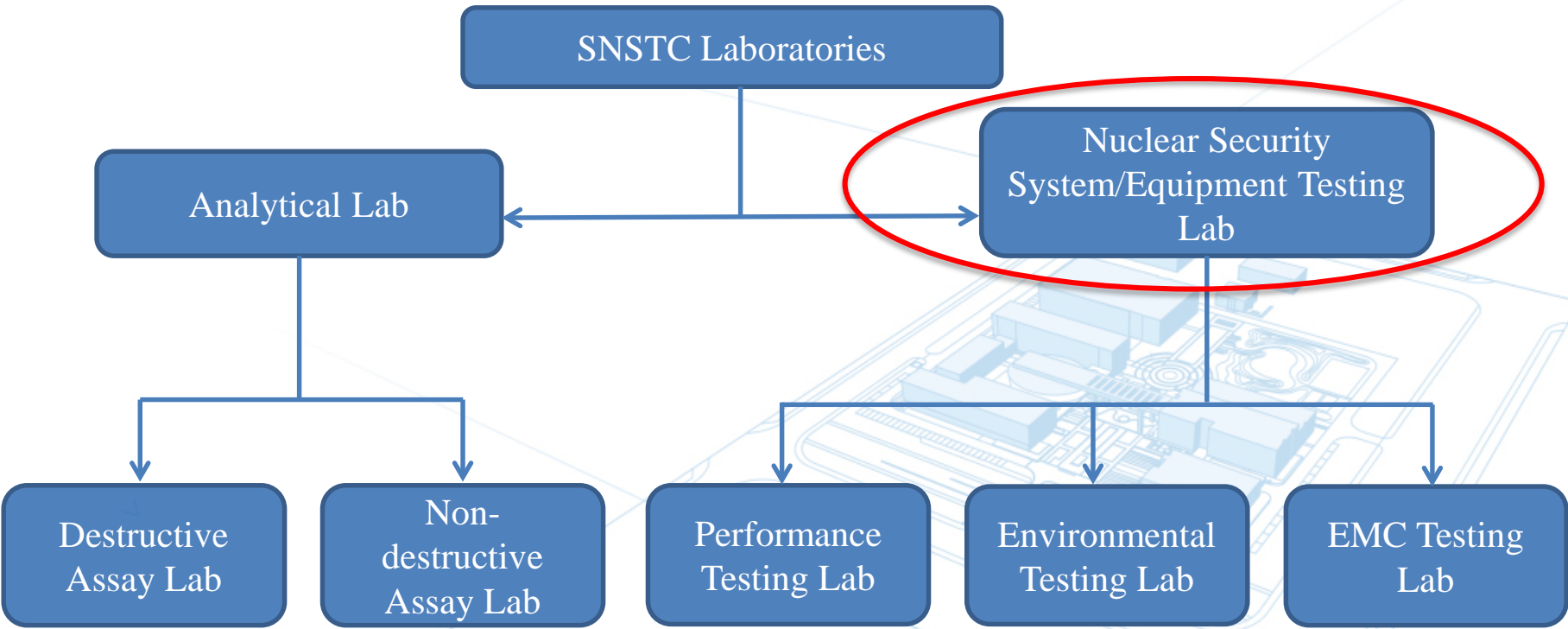
H

科研办公楼
ADMINISTRATIVE
BUILDING



2. Capacities and Qualifications on Performance Testing

➤ Organization of SNSTC Laboratories



2. Capacities and Qualifications on Performance Testing

Environmental & EMC Testing Laboratory

Focuses on testing performance, stability and reliability of nuclear security instruments in different environmental conditions. Many sets of environmental experimental instruments are set up for simulation of harsh environmental conditions including temperature, humidity, rain, sand and dust, salt mist and vibration. An Electromagnetic Compatibility (EMC) system is also established for simulating various electromagnetic environment. Performance testing for radiation detection devices, physical protection components and other equipment used in nuclear security, as well as relevant methodology research can take place in this laboratory.



Vibration Test Table



Sand and Dust Test Equipment



Salt-Mist Test Equipment

2. Capacities and Qualifications on Performance Testing

Environmental & EMC Testing Laboratory



Walk-in Temperature and Humidity Test Equipment



Water Proofing Test System



Xenon Lamp Aging Test Equipment



EMC Test System

2. Capacities and Qualifications on Performance Testing

Indoor Performance Testing Field



2. Capacities and Qualifications on Performance Testing

Outdoor Performance Testing Field



2. Capacities and Qualifications on Performance Testing

Outdoor Performance Testing Field

The outdoor performance testing field is located in the mock nuclear facility; it is the complementation of the environmental & EMC testing laboratory.



2. Capacities and Qualifications on Performance Testing



SNSTC has passed the ISO-9001 QMS test. Its laboratory has been accredited by China National Accreditation Service for Conformity Assessment (CNAS), and authorized by China Metrology Accreditation (CMA) as an accredited laboratory.




中国合格评定国家认可委员会
实验室认可证书

(注册号: CNAS L9989)

兹证明:

国家核安保技术中心实验室
(法人: 国家核安保技术中心)

北京市房山区长阳镇阜盛大街 67 号, 102401

符合 ISO/IEC 17025: 2005《检测和校准实验室能力的通用要求》(CNAS-CL01《检测和校准实验室能力认可准则》)的要求, 具备承担本证书附件所列服务能力, 予以认可。

获认可的能力范围见标有相同认可注册号的证书附件, 证书附件是本证书组成部分。

生效日期: 2018-08-17
截止日期: 2023-05-24



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China National Accreditation Service for Conformity Assessment
LABORATORY ACCREDITATION CERTIFICATE
(Registration No. CNAS L9989)

The Laboratory of State Nuclear Security Technology Center

(Legal Entity: State Nuclear Security Technology Center)

No.67, Fusheng Street, Changyang, Fangshan District, Beijing, China
is accredited in accordance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence to undertake the service described in the schedule attached to this certificate.

The scope of accreditation is detailed in the attached schedule bearing the same registration number as above. The schedule forms an integral part of this certificate.

Effectivity Date: 2018-08-17
Expiry Date: 2023-05-24

Signed on behalf of China National Accreditation Service for Conformity Assessment 

China National Accreditation Service for Conformity Assessment (CNAS) is authorized by Certification and Accreditation Administration of the People's Republic of China (CNCA) to operate the national accreditation schemes for conformity assessment. CNAS is a signatory of the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement (ILAC MRA) and the Asia Pacific Laboratory Accreditation Cooperation Mutual Recognition Arrangement (APLAC MRA). The validity of the certificate can be checked on CNAS website at <http://www.cnas.org.cn/english/index.html>



检验检测机构
资质认定证书

编号: 170021183978

名称: 国家核安保技术中心实验室

地址: 北京市房山区长阳镇明理东路 1 号 (102401)

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检验检测能力及授权签字人见证书附表。

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许可使用标志  发证日期: 2017 年 06 月 14 日

有效期至: 2023 年 05 月 13 日

发证机关: 

本证书由国家认证认可监督管理委员会监制, 在中华人民共和国境内有效。

3. Practices and Cases

- SNSTC has completed more than 450 tests for about 100 sets of radiation detection and physical protection equipment for nuclear facilities, customs, universities and other relevant stakeholders. As a third-party testing agency, SNSTC was commissioned by General Administration of China Customs to take performance testing and acceptance testing for the radiation portal monitors to be deployed at border ports in 2017-2018. The testing included 46 test items, covered the various aspects such as radiation detection function, radiation detection performance, environmental adaptability, electromagnetic compatibility and long-term reliability, etc.
- In the past two years, SNSTC also developed a series of departmental rules and technical documents such as the Management Measures on Acceptance of Physical Protection Engineering, the Technical Guidance on Acceptance Test of Physical Protection System in Nuclear Facilities, the Technical Guide for Central Control Room of Physical Protection System in Nuclear Facilities, the Technical Guide of Digital Radiation Imaging Device used for Vehicle Access Control in Nuclear Facilities and so on. Meanwhile, SNSTC led the technical review and in-field acceptance testing for several physical protection system upgrading projects in China, and conducted the physical protection system effectiveness evaluations for many times as requested by nuclear facility operators.

3. Practices and Cases

◆ Case 1: Performance Testing of Physical Protection Equipment for PPS Upgrade at a facility

In the second half of 2017, SNSTC carried out the performance test of several physical protection equipment used for a facility's PPS upgrade. The test included indoor and outdoor testing and assessment.

Testing and assessment in lab conditions



Temperature-humidity test



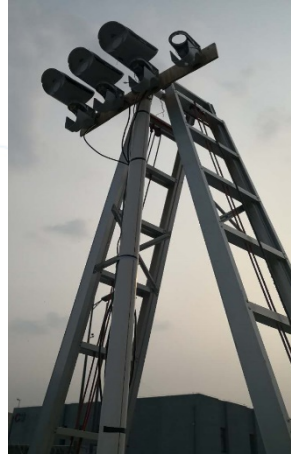
Water proofing test



Salt-mist test

Case 1: Performance Testing of Physical Protection Equipment for PPS Upgrade at a facility

Performance Test in field conditions

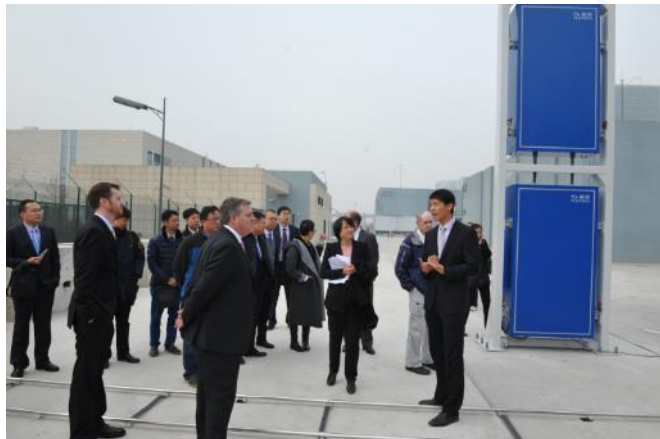


3. Practices and Cases

◆ Case 2: Performance Testing of Radiation Detection Equipment to be deployed at border and ports

SNSTC was commissioned by General Administration of China Customs to take performance testing for the radiation portal monitors to be deployed at border ports in 2017-2018. The content of test included:

- Radiation detection performance
- Environmental adaptability
- Long-term reliability, etc.



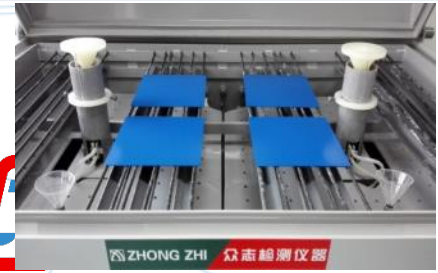
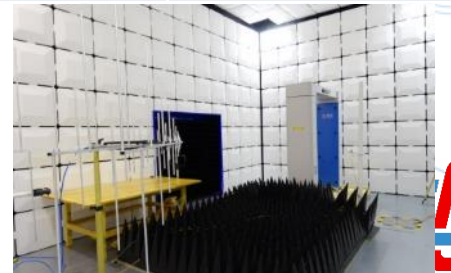
Case 2: Performance Testing of Radiation Detection Equipment to be deployed at border and ports

- Radioactive Sources: ^{40}K 、 ^{57}Co 、 ^{60}Co 、 $^{99\text{m}}\text{Tc}$ 、 ^{131}I 、 ^{133}Ba 、 ^{137}Cs 、 ^{226}Ra 、 ^{232}Th 、 ^{241}Am
- Nuclear Materials: PuO_2 、DU、HEU
- Detection Points: Bottom, 1/4 Height, 1/2 Height, 3/4 Height, Top
- Velocity of Passage: 2.2m/s

Test Category	Test Scenario	Scenario No.
Radiation Detection Performance	False Alarm	A1
	Response to gamma-ray radiation	A2
	Response to Neutron Radiation	A3
	Effect of background	A4
	Single nuclide identification	A5
	Shielded radionuclide identification	A6
	Multiple nuclides identification and shielding	A7
	Identification to the nuclides out of Nuclide library	A8

Case 2: Performance Testing of Radiation Detection Equipment to be deployed at border and ports

Test Category	Test Scenario	Scenario No.
Environmental Adaptability Test	Temperature Test	B1
	Humidity Test	B2
	Dust Proofing Test	B3
	Water Proofing Test	B4
	Vibration Test	B5
	Electrostatic discharge Test	B6
	Radio-frequency immunity test	B7
	Radio-frequency emission test	B8
	Conducted disturbance test	B9
	Magnetic field immunity test	B10
	Surge immunity Test	B11
	Electrical fast transient pulse train Test	B12



Case 2: Performance Testing of Radiation Detection Equipment to be deployed at border and ports

- The first comprehensive performance testing system for radiation detection equipment in China was established through this program, the test and assessment result was applied by China Customs as an important basis for purchasing RPMs for border and ports.
- Establishment of the performance testing and evaluation system, has provided strong support for China Customs to improve its technical capability for combating nuclear smuggling.

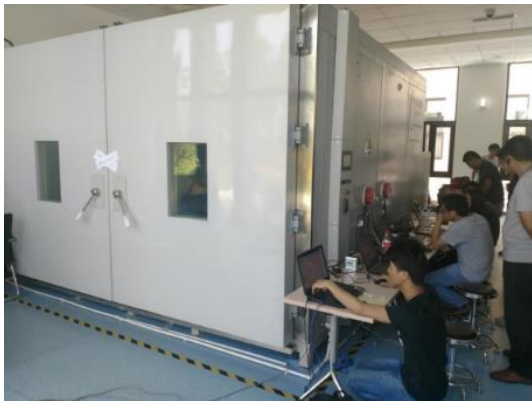


3. Practices and Cases

◆ Case 3: Performance Testing of Environmental Radiation Monitoring Equipment

SNSTC was commissioned by the Ministry of Ecological Environment of China (MEE) to take performance test for several environmental radiation monitoring equipment, including ionization chamber radiation monitors, NaI Radiation monitors, extra-large flow aerosol collectors, etc. More than 20 types of equipment provided by 10 potential suppliers were tested. The test consisted of 3 parts:

- **Temperature-Humidity Test:**
- **Vibration Test:**
- **Performance Test:**



3. Practices and Cases

◆ Two Coordinated Research Project(CRP) of IAEA

- 《Improved Assessment of Initial Alarms from Radiation Detection Instruments》
- 《The Development of LaBr3 Detection System which can Realize Rapid Identification and Analysis of Radionuclides》

◆ Patents for invention

1. A personnel security check system for access control of nuclear facilities. (Patent Number: 20171108646576)
2. A vehicle security check system for access control of nuclear facilities. (Patent Number: 20171108646400)
3. A nuclear security table-top tool and its application. (Patent Number: 2018100053914)
4. An operation management tool for physical protection system. (Patent Number: 2018200096224)
5. An on-line detection system, installation and method for radioactive air. (Patent Number: 2018106079246)
6. A high-level security inspection system and method to mitigate risk of unauthorized intrusion. (Patent Number: 2018106926721)
7. A microwave testing tool and its application method. (Patent Number: 2018110943594)

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◆ Patents for Utility Models

1. A kind of perimeter barriers to protect against climbing. (Patent Number: 2017212215944)
2. A kind of sandboxed perimeter barrier which can set up rapidly. (Patent Number: 2018210144900)
3. A prismatic intrusion alarm system which can set up rapidly. (Patent Number: 2018210145227)
4. A reliability testing system for security detection equipment. (Patent Number: 2018210199392)
5. A microwave testing tool for detection area of microwave correlation detector. (Patent Number: 201821532518X)

4. Prospect

CAEA has signed an Agreement on Collaborating Center for Nuclear Security Technologies with IAEA on September 10, 2019. SNSTC will participate in the IAEA Collaborating Center Scheme as an IAEA Collaborating Center. SNSTC will earnestly implement the work plan and continue to support IAEA in performance testing of radiation detection system and equipment, performance testing of physical protection system and measures, curricula development and training on performance testing in the future.



Thank you for your attention

