JAEA/ISCN Activity Report

INOUE Naoko

Integrated Support Center for Nuclear Nonproliferation, Security and Human Resource Development (ISCN)

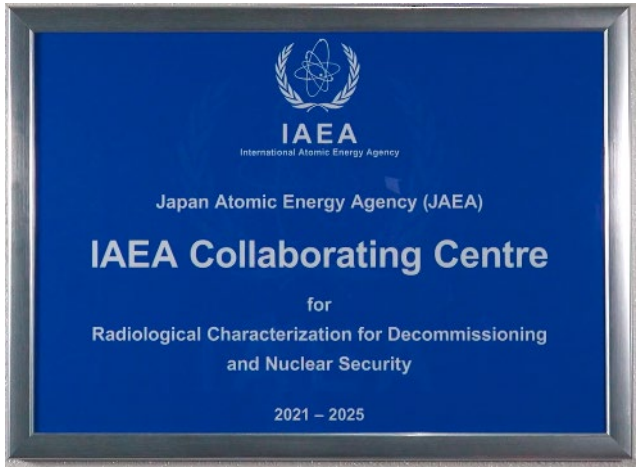
Japan Atomic Energy Agency

International Forum on Peaceful Use of Nuclear Energy, Nuclear Non-proliferation and Nuclear Security
"Strengthening Nuclear Security Resilience: Advancing Nuclear Forensics, Capacity Building and Technical Cooperation"
11 December 2025

Japan's National Statement at 2010 Nuclear Security Summit and Establishment of ISCN

- Establishment of an integrated support center for nuclear nonproliferation and nuclear security in JAEA
- Development of technology related to measurement and detection of nuclear material and nuclear forensics based on international cooperation.
- Contribute to the improvement of global nuclear security・・・ by implementing human resource development programs

➡ December 10, 2010 Establishment of (original) ISCN/JAEA

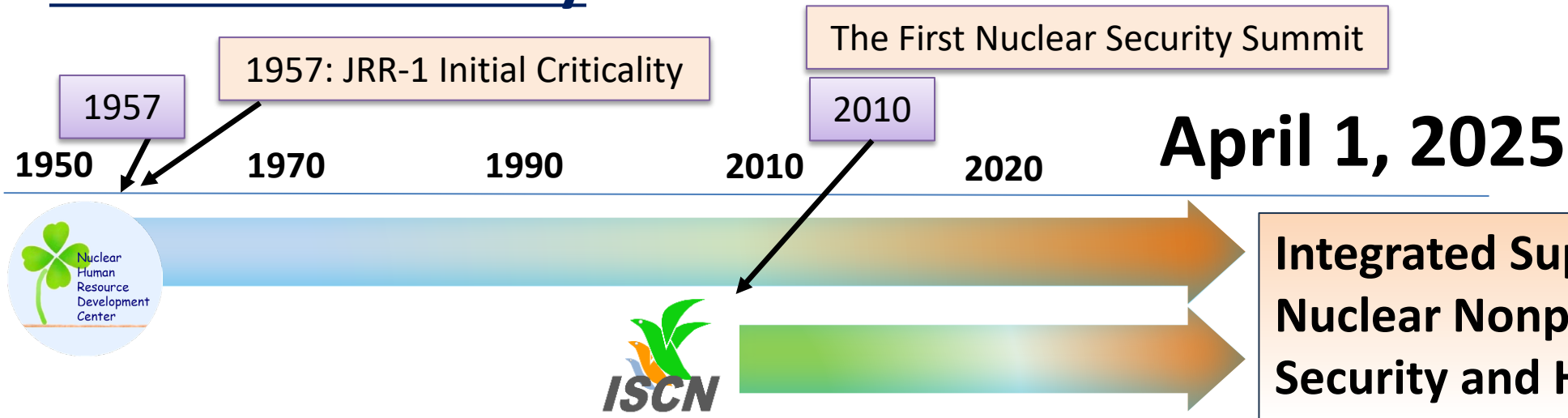


JAEA designation as an IAEA Collaborating Centre for nuclear security (and decommissioning and waste management) on October 22, 2021

➡ October 22, 2021 Designated as IAEA Collaborating Centre for Nuclear Security

➡ April 1, 2025, Establishment of Integrated Center for Nuclear Nonproliferation, Security, and Human Resource Development (new ISCN)

New ISCN: History



Nuclear Human Resource Development Center (NuHRDeC)

- Education and Training for nuclear researchers/engineers

Integrated Support Center for Nuclear Nonproliferation and Nuclear Security (ISCN)

- Advance fundamental technologies for enhancing 2S as part of international cooperation
- Capacity Building Support for Asian countries in collaboration with international partners

Integrated Support Center for Nuclear Nonproliferation, Security and Human Resource Development (ISCN)

Mission:

- The Sound Development of Nuclear Science and Technology
- The Realization of a World Free from the Threats of Nuclear Weapons and Nuclear Terrorism

3S Capacity Building Support

×

2S Technological Development and Cooperation

The Image of New ISCN

the World without threat of nuclear weapons and nuclear terrorism and sound development of nuclear science and technology

Capacity Building / HRD support

National

Global

JAEA

2S Technology R&D

Policy Research

Asia

CTBT Cooperation

Nuclear facilities, expertise, and experiences of JAEA

Practical exercise

Practical training using research reactors

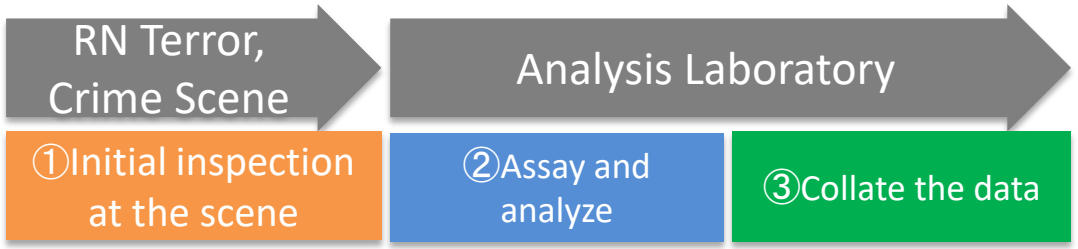
ISCN Exercise Field –Realistic environment and VR integration –

Research and Development Activities for Nuclear Nonproliferation and Nuclear Security

Nuclear Security

Nuclear Forensics

- Technical capabilities that support investigations through the analysis of the composition and physical and chemical characteristics of illicit nuclear and radioactive materials seized by law-enforcement authorities, to identify their origin, history, transport pathways, and intended use.



Nuclear Forensics Process

Material Attractiveness evaluation study

- Develop a methodology to evaluate attractiveness of materials in fuel cycle process under Japan-US cooperation
- 1) Theft for the purpose of manufacturing nuclear explosive devices, 2) Theft for the purpose of manufacturing radioactive dispersal devices, 3) Sabotage
- Regarding 1), **Japan's first workshop was held**, and its findings were shared with members of the Institute of Nuclear Materials Management Japan Chapter and the Atomic Energy Society of Japan.

Rapid nuclear and radioactive material detection technologies covering Broad-area

- For prevention of nuclear and/or radiological terrorism at major public events, monitoring and detection technologies to survey the presence of illicit radioactive materials.

Nuclear Nonproliferation

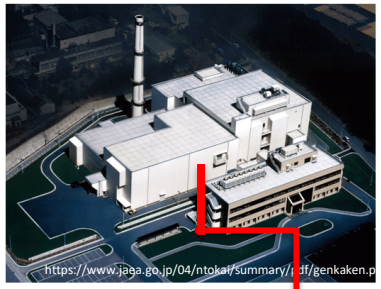
Development of active neutron NDA techniques

- Technology for detecting nuclear materials concealed in containers and for quantifying small amounts of nuclear materials in highly radioactive samples.
- Non-destructive analysis (NDA) using radiation—such as fission neutrons and gamma rays—generated by nuclear reactions induced by external neutron irradiation, as well as analysis using transmitted neutrons.
- **Neutron resonance analysis (NRA)** and delayed gamma-ray spectroscopy.

Recent Achievements (Nuclear Forensics)

1. Commencement of Laboratory Preparation for the Development of Plutonium (Pu) Nuclear Forensics Analytical Techniques

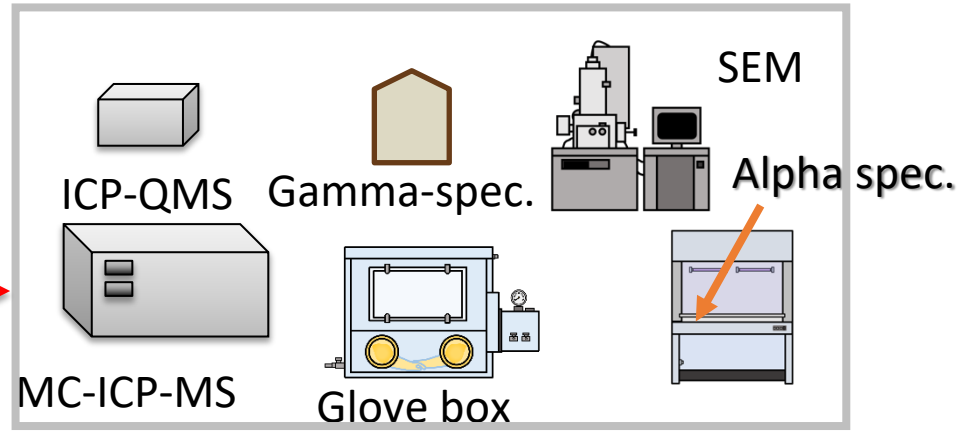
- In addition to uranium nuclear forensics, nuclear forensic capabilities targeting plutonium (Pu) will be established to enhance response capabilities against nuclear terrorism and related incidents involving Pu.



NUCEF

Nuclear Fuel Cycle Safety Engineering Research Facility

Laboratory Layout (Image)

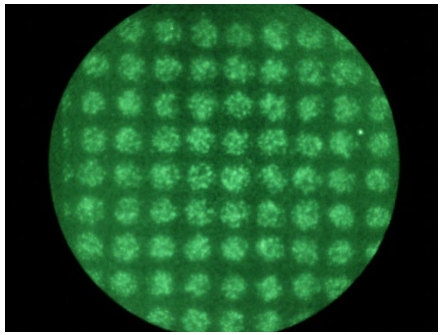


2. Development of Low-Cost Technologies Useful for Initial On-Site Response

- Simple and low-cost technologies were developed to support initial on-site response by investigative authorities.
- Baseline tests were conducted on a contamination distribution visualization technique for evidentiary items based on a commercially available digital single-lens reflex camera equipped with a CMOS sensor, and its fundamental performance was verified.

Basic Test for Visualization Device

Imaging of an Alpha Radiation Source Using the Visualization Device



Article：Kimura et al., *Improving Uranium Identification Accuracy Using Deep Learning–Based Electron Microscopy Image Analysis for Nuclear Forensics*, Best Paper Award, 45th INMMJ Annual Meeting

Recent Achievements（Nuclear Detection and Measurement）

ISCN

1. Neutron resonance analysis (NRA)

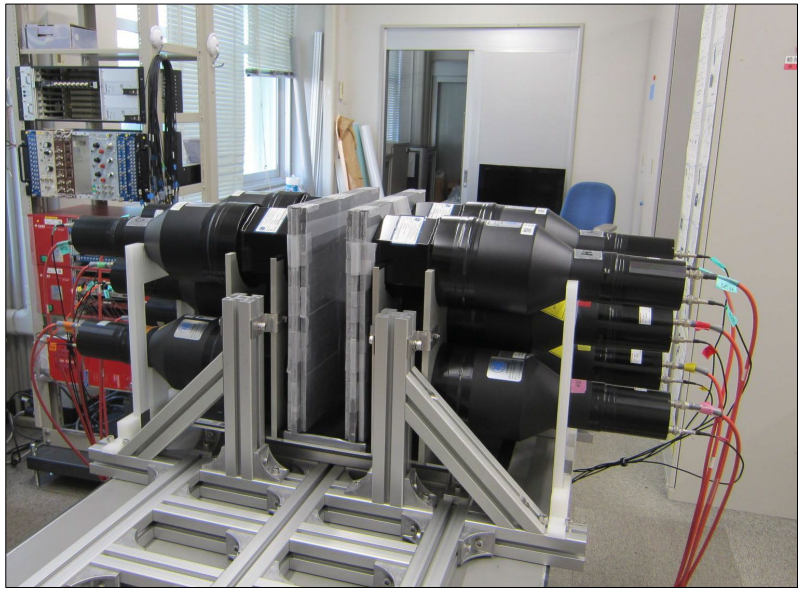
A device that measures both neutrons and gamma rays emitted when a sample containing nuclear material is irradiated with a neutron beam.

+Multiple detectors and shielding arranged effectively

⇒ Significantly improved detection efficiency, along with enhanced neutron/gamma-ray discrimination capability.

→ Ability to detect and quantify fissile material with greater precision and in a shorter time.

Article: Koizumi et al., Demonstration of Shape Analysis of Neutron Resonance Transmission Spectrum Measured with a Laser-driven Neutron Source, Scientific Report 14, 21916 (2024)



Multiple detectors for NRA

2. Broad-area nuclear and radioactive (N/M) material detection

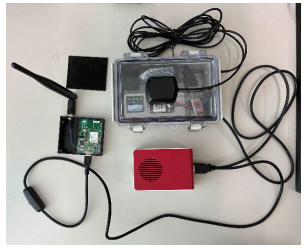
Portable device to detect N/M materials

+Visualization System of measurement data in real-time

⇒ Locate and Identify the gamma-ray source

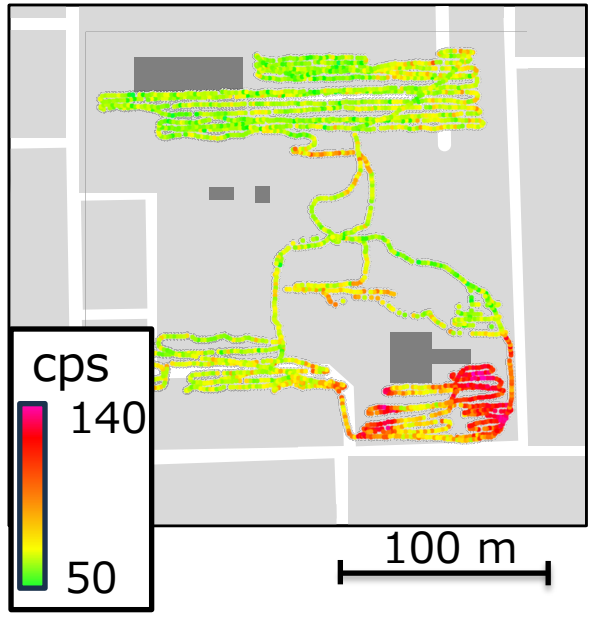
→ Quick detection of dirty bombs

Measurement using portable device



Data transfer

Aggregate
Accumulate
+ Visualize



Report : Takahashi, et. al, Development of Nuclear Security Technologies for a Large Public Event, JAEA-Review, 2025-039, 34 Pages, 2025/11

Efforts toward Social Implementation

JAEA booth at SEECAT

Intersec

1. SEECAT, Special Equipment Exhibition & Conference for Anti-Terrorism

The only exhibition in Japan dedicated to **counter-terrorism**. JAEA/ISCN participates since **2021**.

- Over the three days, **206 visitors**, including professionals in security, defense, public safety, and crisis management.

  (155 in the previous year)

There was an increase in interest in the hybrid detector designed for first response.

2. Intersec

International exhibition for security, defense, fire fighting held in Dubai, UAE

- **119 visitors** from security-related manufacturer and trading company.

  ⇒ **First-time participation in an international exhibition**

Integration of Capacity Building Support for Asia

	Nuclear Nonproliferation and Nuclaer Security *(supported by MEXT)* former ISCN)	**Instructor Training Program (ITP) (*commissioned by MEXT*)** (former NuHRDeC)
Area	・Nuclear security (incl. RI security) ・IAEA Safeguards (SSAC) ・International Framework for Nuclear Non-proliferation and Security	・Nuclear Reactor Engineering ・Nuclear/Radiation Emergency Preparedness and Response (EPR) ・Environmental Radiation Monitoring
Target	・Nuclear Security: 24 countries ・Safeguards : 24 countries ・Main: **Regulator** (R6: 315 participants)	・9 countries ・Main: **Research institutes** (promotor) (R6: 66 participants, excl. hosted abroad)
Courses	In Japan: Security RTC, SSAC RTC, IAEA courses, etc. Abroad: As requested	In Japan: International Training Course (ITC), Advanced ITC, Nuclear seminar Abroad: Follow-up Training Course

- ✓ **3S Capacity Building Support**
- ✓ **Deeper understanding of Asian trends and Training Needs**

Training × **Regular mtg. IAEA Mission** ⇒ **Tailored support to match training needs**

Nuclear Nonproliferation and Nuclear Security

3 Courses (for Asia/Domestic)

①Nuclear Security
- Physical protection, RI security, etc.

②IAEA Safeguards
- SSAC, Non-destructive Assay (NDA)
- IAEA Inspector Training

③International Framework
- Kick-off of bilateral cooperation

Activity Summary (2011–2025 Nov.)
264 courses, 6,940 participants
(117 countries, 6 IOs)

ISCN Exercise Field

Characteristics

- **Tailored training curriculum to reflect the needs of target audience/participants**
- **For effective learning**
  - Collaboration with IAEA、DOE/NNSA, etc.
  - Combination of various tools and methods

E-Learning

Video materials co-developed with IAEA

Video materials co-developed with World Institute for Nuclear Security (WINS)

Virtual Tour

ISCN Exercise Field (Upgraded Apr. 2024)

Exterior

PTZ Camera
Hybrid Camera
Fix Camera × 2

Buried E-Field Sensor

Infrared Sensor
Microwave Sensor

Thermal Camera

Laser Sensor

High-Definition Camera

Infrared & microwave Dual Sensor

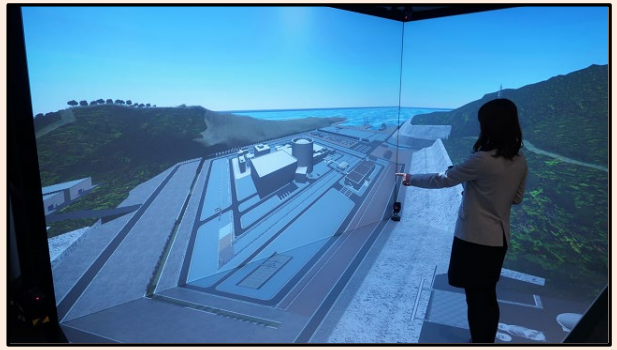
Free-Standing X-Field Sensor

Interior

Mock Central Alarm Station (Mock-CAS)

Server room

Entry Control equipment room



Virtual Reality

2025 Achievements (1)

Domestic Support

➢ Physical Protection Course

➢ Nuclear Security Culture

1. Workshop with WINS

- Insider Threat (2024), Supply Chain Risk (2025)
- Discussion, Keynote by Regulatory Authority
- Using Short Movies with subtitles
  better understanding, repeatable use

2. Culture promotion support at Facilities

- NPPs, other facilities
- Lecture
- Group discussion

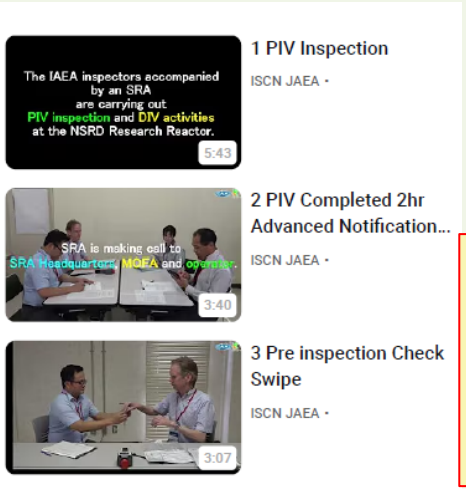
◆ Support domestic nuclear security regime

New Course/Exercises using ISCN Exercise Field

- **Computer security Course** for PP system
- **TTX Course** for nuclear security evaluation
- **Computer security exercises**

◆ Responding to emerging threats/needs

Global use of ISCN Materials



(For Safeguards courses)
Developed **IAEA Complementary Access Video Materials**

◆ Provide to IAEA, Regulatory Authority
◆ Shared w/ Member States via IAEA Website

2025 Achievements (2)

With US DOE: RI(radiological)

8th Regional Review Meeting

May 2025

With US DOE: SMR

WS on Nuclear Security for New Builds

Aug 2025

- Regional/national trends and needs on **Radiological Security and SMR**
- Enhancing nuclear security through **US-Japan Cooperation**

Safeguards

SSAC RTC June 2025

- **Quality enhancement by improving lecture guide**

IAEA Lise Meitner

Aug. 2025

Asia Regional Network

Sep. 2025

- **IAEA Cooperation**: IAEA Collaboration Centre, Nuclear Security Support Centre (NSSC) Network

Nuclear Security

PP RTC Oct. 2025

- **Continuous support for Ukraine**
- **Enhance Security in Asia**

Creating Momentum for Nuclear NP/Security Education

Strengthen **support for universities** and **foster student interest and talent acquisition**, through enhancing ISCN Summer School, in cooperation with IAEA, relevant agencies, JAEA, ANEC, and Asia

➢ Series of Milestone Evnets

① **2024 International Forum: HRD and Collaboration bet. research institutes and universities (Dec. 2024)**

② hosting **IAEA INSEN Annual Meeting (Nov. 2025)** : first outside of Vienna

ISCN led two Panel Sessions and organized ISCN Exercise Field Tour

- ◆ Confirm **importance of nuclear security education** in Japan
- ◆ Gain **Good Practices** for **high quality** education material development

③ Domestic **Education Material Development Workshop** with INSEN Experts (Mar. 2026)

- Materials for ANEC

④ hosting **IAEA Marie Sklodowska-Curie Fellowship Program (MSCFP) Nuclear Security School** (Jul-Aug 2026): first outside of Vienna

focusing on nuclear nonproliferation/security; visit Hiroshima, engage with Japanese students

Cooperation with the International Verification Regime for the Comprehensive Nuclear-Test-Ban Treaty (CTBT)

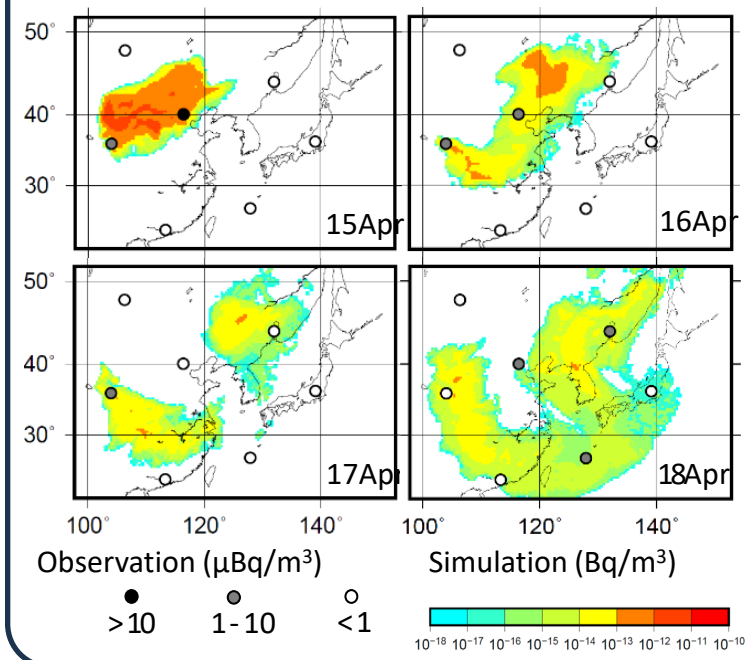
JAEA/ISCN operates CTBT radionuclide monitoring stations in Okinawa and Takasaki for the detection of nuclear tests

- Trace amounts of cesium-137 were occasionally detected at the Okinawa station in early spring

→ **investigate the release source**

CTBT Okinawa station

Verification of the "Global Fallout Origin in Yellow Sand" Hypothesis using the atmospheric dispersion simulation



- Assuming the desert, the primary source of yellow sand, as the release source
- Assuming the release began 3 to 4 days prior to the detection of cesium-137 at the Okinawa station

→ **The simulation very well reproduced the detection status of cesium-137 at the surrounding observation stations**

There is no contradiction in considering the cesium-137 detected at the CTBT Okinawa station to be of global Faure fallout origin in yellow sand

Contributing to the improvement of nuclear test detection capabilities

Policy Research Study: Achievement

1. Outreach of the research results on issues and countermeasures for the SMR nuclear security

- Presented a paper on SMR Security By Design (SeBD) at “International Workshop on Nuclear Security for New Builds ”(co-hosted by DOE) and the Annual Meeting of Institute of Nuclear Management (INMM) Japan Chapter”(paper presentation).

2. Participation in Nuclear Security WG(Regulatory Track) under IAEA NHSI (Nuclear Harmonization and Standardization Initiative)

- Developing guidelines for SMR SeBD
- Contributing based on knowledge gained through Asian cooperation, such as encouraging consideration of not only the reactor but also the nuclear security regime of the new nuclear nations, and ensuring that this consideration is reflected in the checklist.

3. Outreach of the investigation results of the US reprocessing movement under President Trump's second term and the end of the US-Russia Plutonium Management and Disposition Agreement (PMDA)

- Shift from a once-through fuel cycle policy to a reprocessing/SMR/MMR policy
- Other departments in JAEA (advanced reactor related parties, International Affairs Department, Overseas Business Strategy Department, etc.): sharing related information each other
- Outside JAEA: ISCN Newsletter; individual exchanges of opinions to be held in the future

Public Communication(Raising awarenes, Information sharing)

ISCN's Mission: The Sound Development of Nuclear Science and Technology and the Realization of a World Free from the Threats of Nuclear Weapons and Nuclear Terrorism

Vision: To become a hub in Asia through the support of "3S human resource development and the development and cooperation of 2S technologies

To achieve this goal

- Essential for the public to understand the importance of nuclear nonproliferation and security.
- For this purpose, actively promote awareness.

ISCN Newsletter

Monthly distribution (approx. 780 recipients)

Main contents:

- Global nuclear nonproliferation and security trends
- Capacity-building training and conference reports
- Technology highlights

International Forum on Peaceful Use of Nuclear Energy, Nuclear Non-Proliferation and Nuclear Security

" Human resource development in the field of nuclear non-proliferation and nuclear security and collaboration between universities and research institutions" 10 Dec. 2024

Collaboration Video with YouTuber GENKI LABO

ISCN

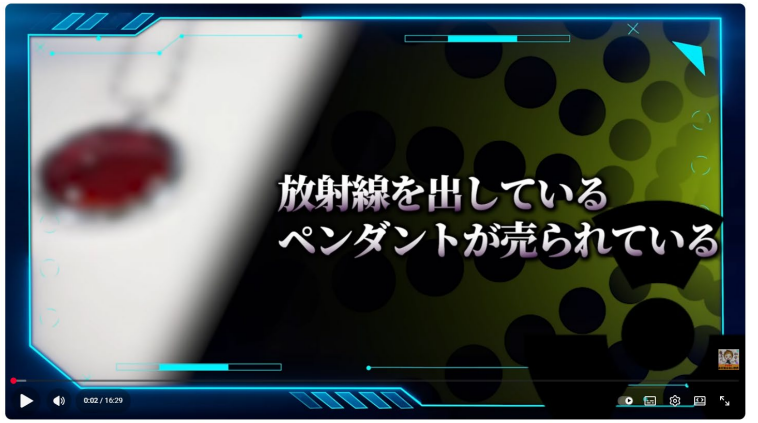
◆Four collaboration videos (two long-form and two short-form) will be produced and published on YouTube over 1.25 million views

- Long Video ①[Inside Access] Tracing the Origin of “Privately Held Uranium” by Measuring It at a High-Security Nuclear Science Research Institute
- Long Video ②The Necklace I Bought Online Is Emitting Radiation!? Full Scientific Analysis
- Short Video ①A First for YouTubers! Gaining Access to a Nuclear Science Research Institute
- Short Video ②[Inside Access] Tracing the Origin of “Privately Held Uranium” by Measuring It at a High-Security Nuclear Science Research Institute

Long Video①
(35:10)

Short Video①
(2:10)

Long Video②
(16:30)



Short Video②
(2:06)

International Forum 2025 on the Peaceful Use of Nuclear Energy, Nuclear Nonproliferation, and Nuclear Security Strengthening Nuclear Security Resilience：Advancing Nuclear Forensics, Capacity building and Technical Cooperation

ISCN

Background

- ◆ JAEA expands Nuclear Forensics R&D and cooperation, as an IAEA collaboration center
- ◆ JAEA is working to advance response frameworks for nuclear and radiological terrorism (RN terr develop nuclear forensics technologies.

- ◆ Needs for cooperation in the development of nuclear forensics technologies in Asia
  - OAP ： Regional Training Course on Nuclear Forensics (2023) 、US DOE- ISCN/JAEA: Search and Secur Training for Lao P.D.R
  - BRIN : Hosted researchers (twice) and presented their results at international conferences
- ◆ Growing interest in nuclear forensics at the 2024 Annual Meeting of the Japan Society of Radioch and at APSORC 2025

Strategic Vision and Objectives of the Forum

・Highlight the significance and future prospects of nuclear forensics
・Promote dialogue to enhance nuclear and radiological terrorism response, strengthen international frameworks, and advance human resource development and regional cooperation.

To achieve this goal

Reaffirming the Role of Nuclear Forensics to Strengthen Nuclear Security Resilience

Summary of JAEA/ISCN Activities

【2S Technology R&D】

- ○Advancing nuclear forensics (AI, plutonium/UOC analysis, contamination visualization)
- ○Enhancing nuclear and radioactive material detection (wide-area, robotics, real-time monitoring)
- ○Developing rapid, high-precision measurement using active neutron NDA/NRA
- ○Sharing results at counter-terrorism exhibitions (SEECAT, Intersec)

【Capacity Building / HRD support】

- ○Instructor training for Asia (Reactor engineering, Emergency preparedness and response, Environmental monitoring)
- ○Nuclear non-proliferation and nuclear security training (315 participants/year, 24 countries)
- ○Practical training in collaboration with IAEA, DOE, and others
- ○Enhanced experience-based training combining Exercise Field and VR

【Policy Research, Collaboration with academic societies and universities】

- ○Analysis of Safeguards and Security (2S) issues in light of the Ukraine crisis
- ○Investigation of 2S issues and countermeasures for advanced reactors, including SMRs

- ○International collaboration in CTBT operations and noble gas monitoring
- ○Collaboration with universities and scientific societies, hosting the 2025 INSEN Annual Meeting in Japan

【Public Communication】

- ○Wide-scale outreach via YouTube (over 1.25 million views)
- ○Monthly newsletter distribution
- ○Enhancing global and domestic outreach via the JAEA/ISCN International Forum

Thank you for your kind attention.

Please access to our Website

https://www.jaea.go.jp/04/iscn/index_en.html/