Expanded Testing Capabilities at the Y-12 Nuclear Detection and Sensor Testing Center

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Abstract

The newly commissioned Y-12 Nuclear Detection and Sensor Testing Center (NDSTC) provides testing environments for members of the research and development communities to validate their radiation detection systems using Enriched and Highly Enriched Uranium (EU - HEU) materials. NDSTC users may deploy and operate their own instrumentation. Two testing sites are operational. 'Site 1' allows access to Category I quantities of ^{235}U. A second set of testing venues (Site 2) are available for measurements using Category IV quantities of ^{235}U.

Site 1

A dedicated testing area that allows access to Category I quantities of ^{235}U in configurations that address customer programmatic requirements.

Examples of measurement activities approved for Site 1:

- Active Interrogation (AI) of HEU objects (e.g. with D-T neutron generators and ^{252}Cf sources)
- Gamma-ray and neutron tomography of objects
- Passive measurements of containerized materials/objects in storage arrays
- Weapons disassembly and component tracking for Treaty Verification
- Real-time identification and tracking of specific objects/materials containing HEU
- HDPE reflectors/moderators and steel shielding assemblies are available (see Figure 1)

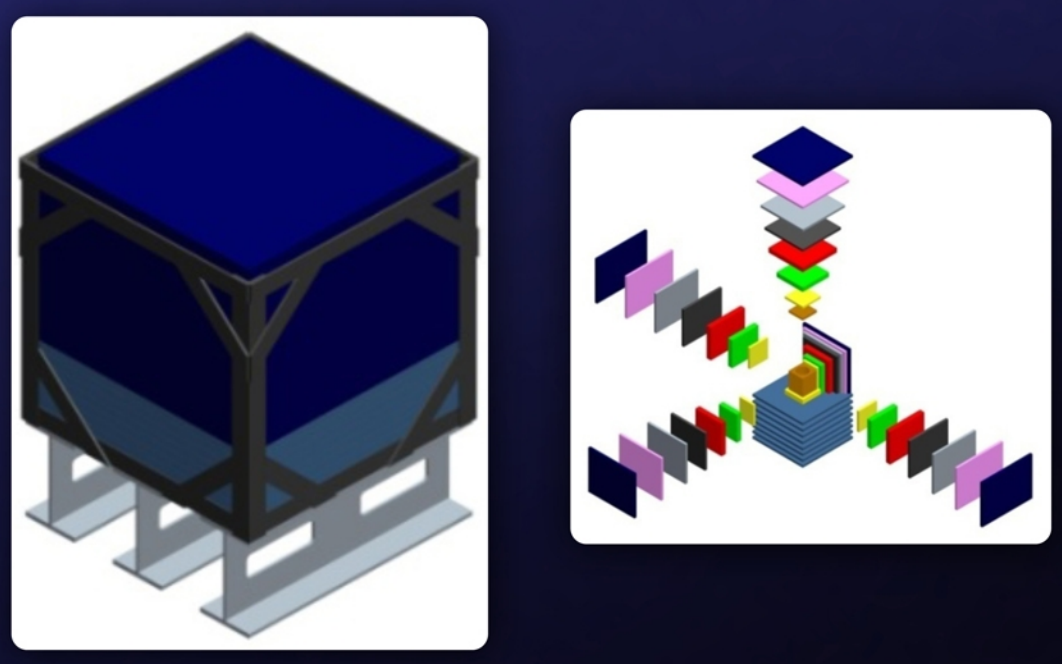

Figure 1
Steel plate shielding assembly (left) and "exploded" rendering (right) depicting shielded HEU source within configurable shielding/reflector. High Density Polyethylene (HDPE) materials and assemblies are also available.

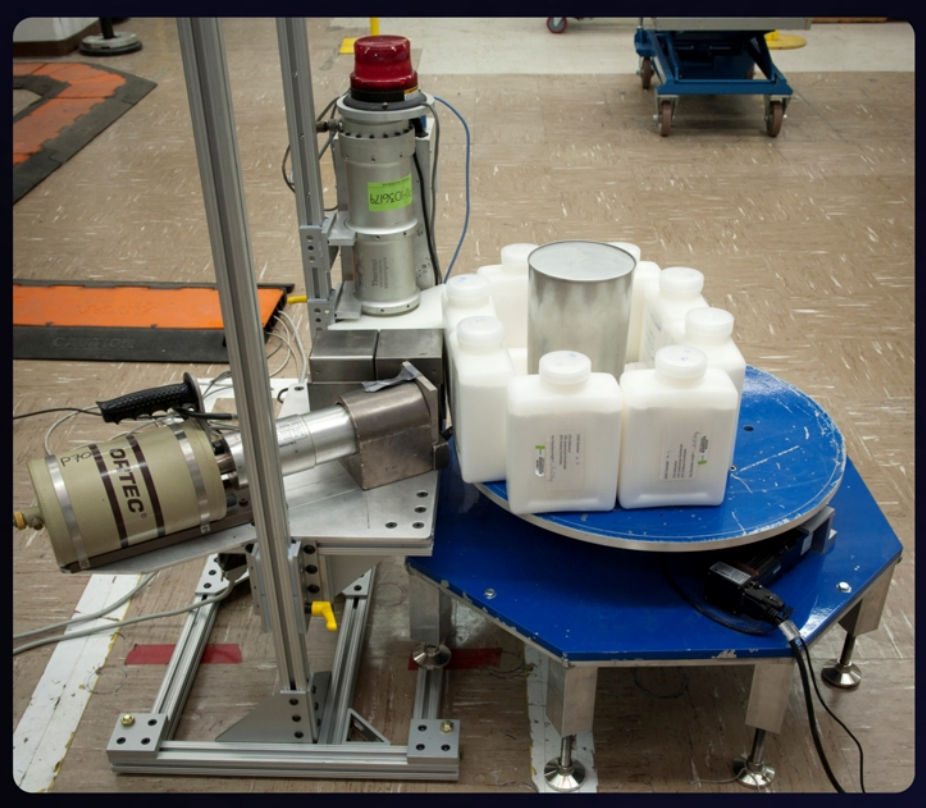

Figure 2
D-T neutron generator and detection system deployed at Y-12 NDSTC Site 1 by Idaho National Laboratory researchers conducting PINS measurements of nuclear materials. Photograph courtesy of Idaho National Laboratory.

Site 2

A less restrictive area where measurements can be taken using Category IV quantities of HEU materials.

- Can accommodate guests with or without security clearances.
- Multiple testing venues
  - 2 Laboratories
  - X-ray vault
  - Passageways
  - Loading Dock
- At Loading Dock, source materials may be deployed in vehicles, trailers, transport containers, etc.
- Available Source Materials
  - Variety of Calibration Sources
  - Uranium Metal Standards
  - U Compounds and Alloys
  - Radiological Signature Training Devices
- Detector systems available for use.

Figure 3
NDSTC Site 2 areas available for performing measurements.

Source materials at Site 2 include metallic uranium standards (Figure 4) ranging from 3% to 93% ^{235}U. Other Site 2 sources include Radiological Signature Training Devices (Figure 5), which closely replicate the gamma-ray spectra of much greater masses of ^{235}U. Other EU sources may be deployed for measurements, including a variety of unclassified HEU metal components and uranium chemical compounds of varying ^{235}U enrichment factors.

Figure 4
EU-HEU uranium metal alloy enrichment standards available at Site 2. ^{235}U contents range from Depleted U to HEU.

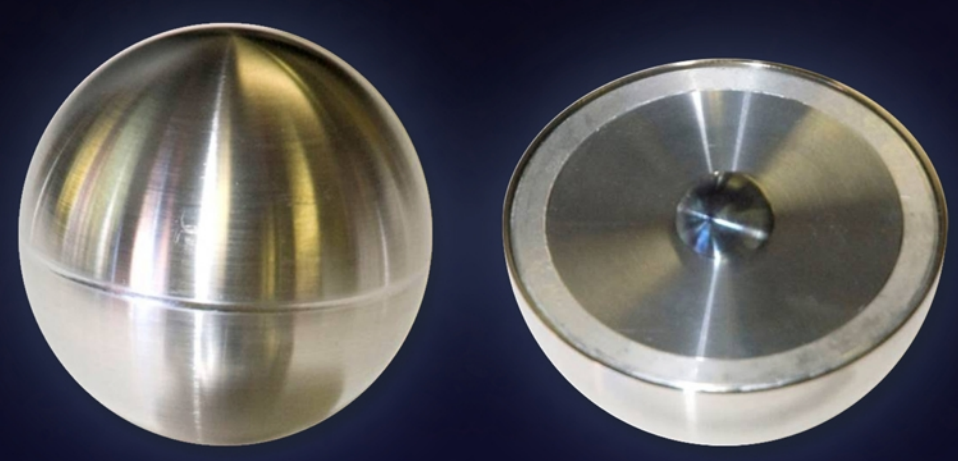

Figure 5
Radiological Signature Training Device—a joint project of Oak Ridge National Laboratory and Y-12 National Security Complex. Devices replicate much greater masses of HEU.

Summary

The Y-12 Nuclear Detection and Sensor Testing Center (NDSTC) is operational. Research and instrumentation groups may submit applications for measurement experiments. Active interrogation and passive measurements are authorized. Specific testing configurations, source materials, and reflector / shielding, and support instrumentation are available to researchers.

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