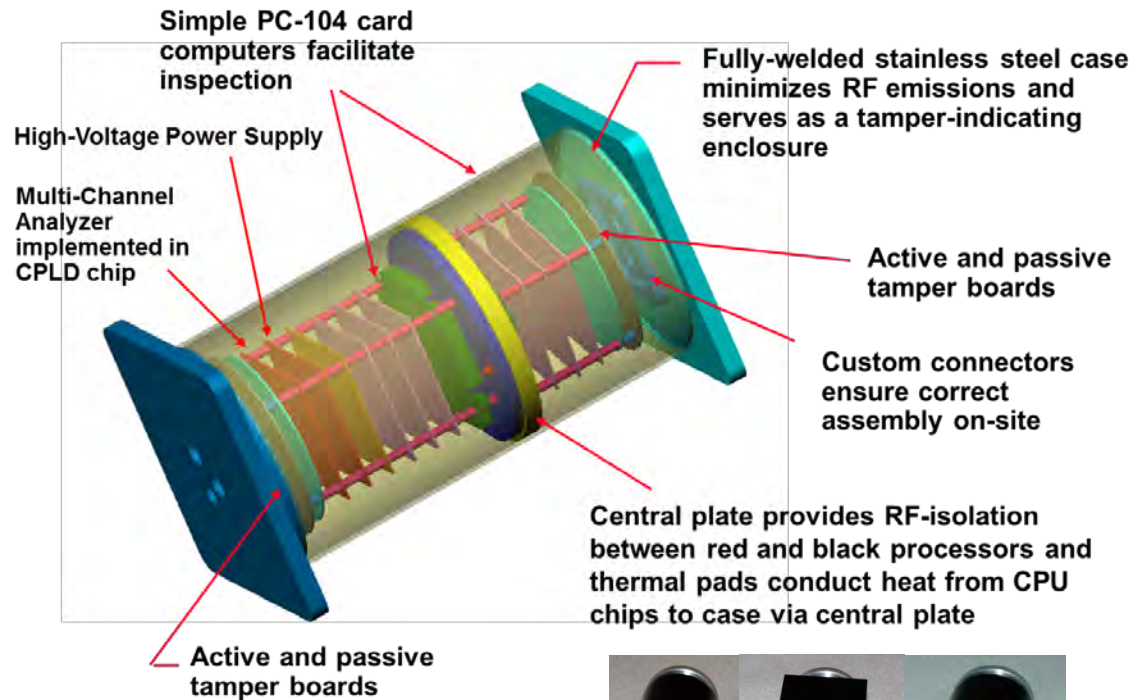# Trusted Radiation Identification System (TRIS)

- Monitoring use – to initialize Treaty Accountable Items into an arms control regime and to maintain continuity of knowledge during storage

- Physical principle of method – uses template matching to confirm that a gamma-ray spectrum is consistent with another weapon or weapon component of the same type

- Trusted system – utilizes information barrier, digital signatures, software authentication, and tamper indicators to establish trust.

Simple PC-104 card computers facilitate inspection

High-Voltage Power Supply

Multi-Channel Analyzer implemented in CPLD chip

Fully-welded stainless steel case minimizes RF emissions and serves as a tamper-indicating enclosure

Active and passive tamper boards

Custom connectors ensure correct assembly on-site

Central plate provides RF-isolation between red and black processors and thermal pads conduct heat from CPU chips to case via central plate

Active and passive tamper boards

"Keys" for creating and storing verifiable templates

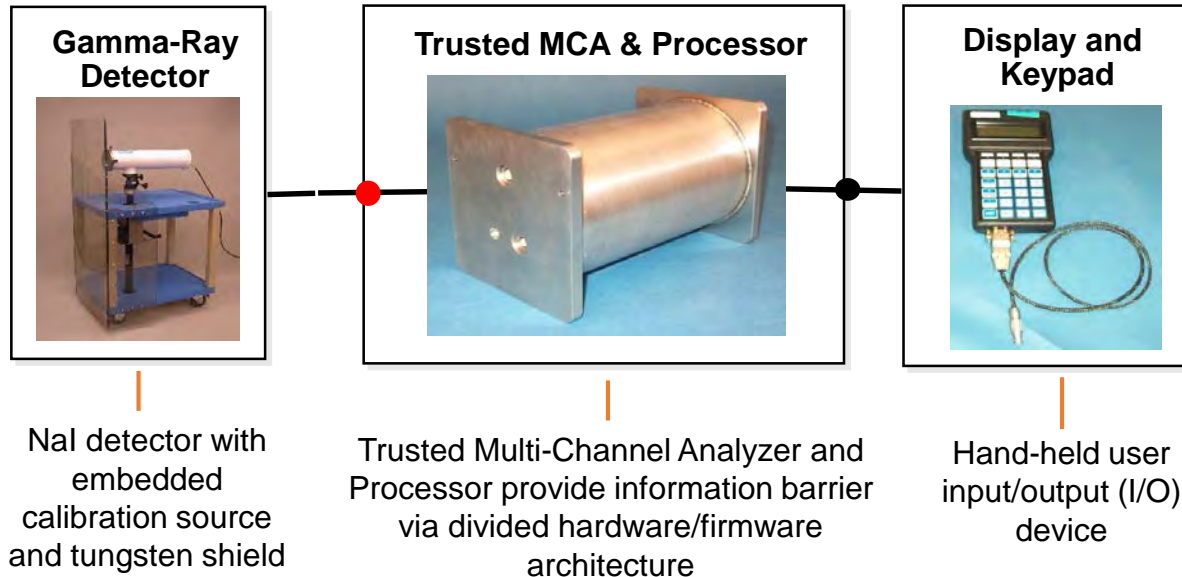SEED #0009   PUBLIC KEY #0012   TEMPLATE #T0013

Trusted Radiation Identification System (TRIS)

- Physical description, size/weight
  - Gamma detector and cart (~20 kg, 65x50x100cm)
  - Trusted processor, display and keyboard (~10kg, 34x20x20cm)
  - External 12V battery pack (~8kg, 40x20x20cm)
- Time required to use and install
  - Setup of equipment – 10-15 minutes
  - Obtaining measurements & performing comparison - 10-15 minutes
- Additional infrastructure required
  - Storage of RDE equipment with intrusion detection in place
  - Storage of templates for future comparison

Gamma-Ray Detector

Trusted MCA & Processor

Display and Keypad

NaI detector with embedded calibration source and tungsten shield

Trusted Multi-Channel Analyzer and Processor provide information barrier via divided hardware/firmware architecture

Hand-held user input/output (I/O) device

Trusted Radiation Identification System (TRIS)

- Technology limits
  - Medium-resolution NaI detectors do not provide the capability to reliably distinguish some isotopes of interest but do provide sufficient resolution for most template applications

- Complexity of hardware, software, use
  - Software and hardware designed with simplicity in mind
  - User provided only with "Confirmed" or "Not Confirmed"
  - Most challenges lie in working with public/private key for the template
  - Custom-designed to eliminate extraneous functionality

- Commercial availability
  - Specialized Sandia National Laboratories design using commercially available parts

- Cost: $100-$150K per system