Mobile Change Detection System

- Monitoring use
  - Inspection activities of tags, seals and tamper-indicating enclosures (TIE)
  - Chain-of-custody verification for warheads, materials, equipment, devices, locked doors, secure areas
- Hand-held mobile device, small and light-weight
  - Uses device camera for image capture
  - Currently tested on smartphones, phablets, tablets, and digital cameras that use the Android OS

- Performs *in-situ* image authentication
- Mobile image software platform does NOT require additional infrastructure

Mobile Change Detection System

- Physical principle of method
  - Image analysis based upon computer algorithms to align images that are acquired with hand-held cameras
  - Human image analysis elicited by flicker technique ("animation effect")
  - Change Detection System (CDS) provides integrated method of capturing, categorizing, aligning and storing large datasets of images of seals

Before Image

After Image

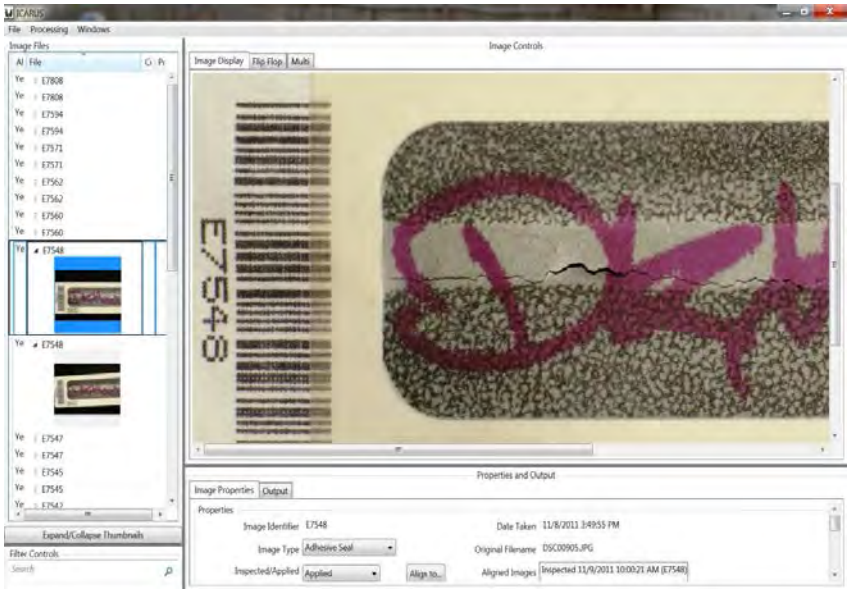
Image after CDS process

Mobile Change Detection System

- Technology limits
  - Being expanded from PC version to Android interface
  - Proposed image processing for other technologies
- Time required to use and install
  - Less than 5 mins to align multiple images simultaneously - typically completes the Classify and Align process of a project file containing 30 images
  - 1-2 mins for image analysis using flickering
  - Minimal time to install software
- Complexity of hardware, software, use
  - Hardware: complex electronics for mobile devices
  - Software: complex imaging algorithms
  - Use: simple user interface with intuitive

  layout and requires minimal training to master
- Other functionality
  - Wide range of functionality available on

  devices including wireless capabilities
- Commercially availability
  - Wide range of commercially-available devices
- Cost
  - $200-1000 for digital platform

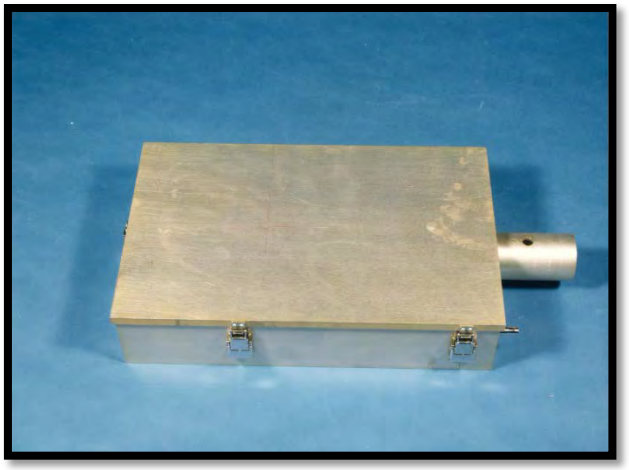


START Treaty
Radiation Detection Equipment

- Monitoring use – verification of warheads, materials, or non-nuclear objects; used by U.S. START & New START inspectors to confirm items declared to be non-nuclear actually are non-nuclear
- Physical principle of method – Neutron measurements collected on an object are compared with measured neutron background
- Time required to use and install
  - Setup of equipment –
    10-15 minutes
  - Measuring of background –
    about 5 minutes
  - Obtaining 2-3 measurements & calculating comparison –
    10-15 minutes

START Treaty
Radiation Detection Equipment

- Physical description, size/weight
  - 4 carrying cases containing 2 detector systems, tripod and mounting gear, and ancillary equipment – 20 pound (9 kg) He-3 detector, 205 pounds (93 kg) total equipment
- Additional infrastructure required
  - Calibration of detector using radioactive source before each use
  - Secure storage of source and RDE equipment



Neutron Detector

Eberline Electronic Counter

Americium-241 w/Li neutron source

START Treaty
Radiation Detection Equipment

National Nuclear Security Administration

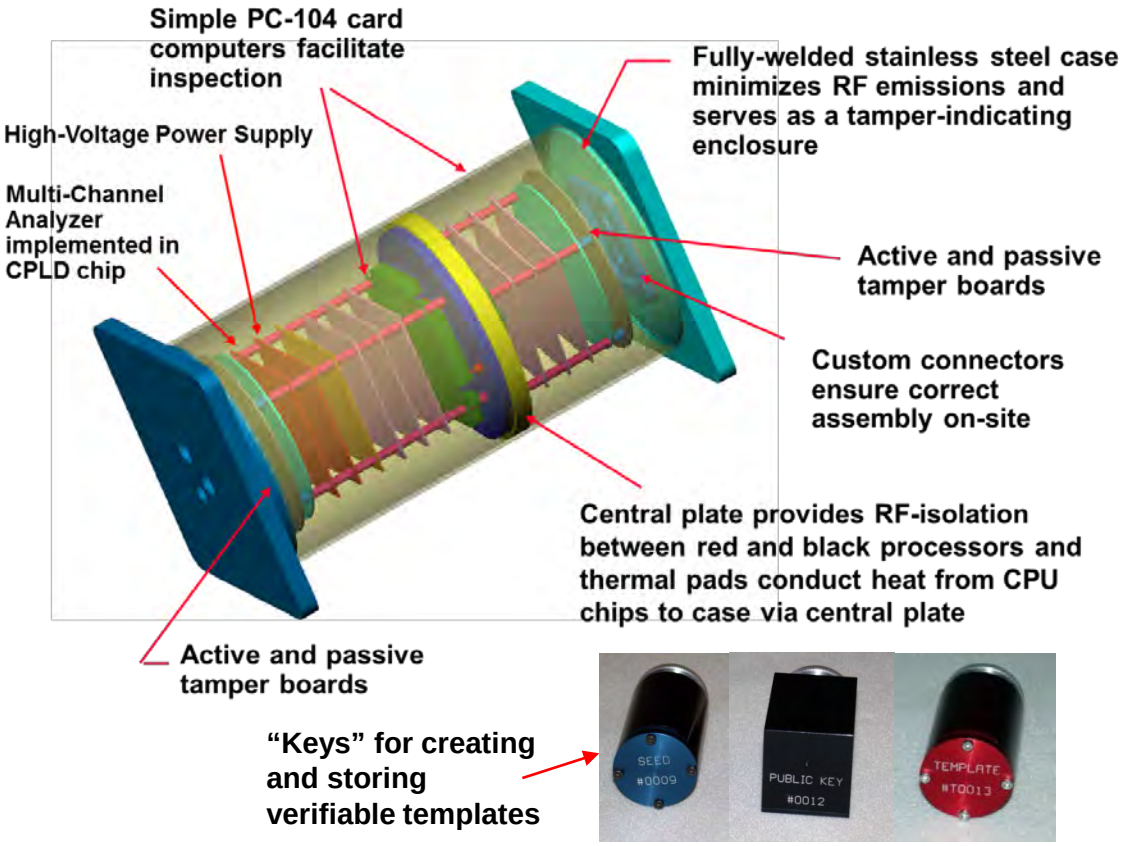
- Technology limits
  - Detection capability limited to neutrons and by the mass of He-3 in the detector configuration
- Complexity of hardware, software, use
  - Equipment is simple to use but heavy to transport and set up
- Other functionality
  - None
- Commercially availability
  - Complete set was a special build by Sandia National Laboratories containing a custom neutron detector and a modified Eberline electronic counter
- Cost
  - True replacement cost of He-3 very high
  - Sunset Technology places current system beyond commercial availability
  - Comparable system with same functionality costs about $150K, if He-3 is available for recycle for new detector. If need to purchase He-3, costs will increase.

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

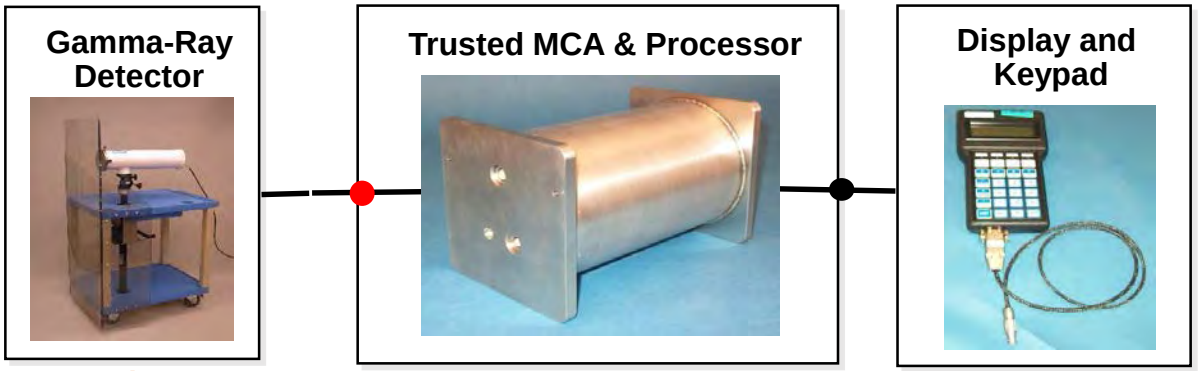
- Physical principle of method – uses template matching to confirm that a gamma-ray spectrum is consistent with another weapon or weapon component of the same type

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



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



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