Entry Control

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Disclaimer

- **All material in this module is unclassified**

- **In this module, photos of equipment are included as examples only**

- **Sandia National Laboratories does not endorse or recommend any specific equipment**

Outline

- **Personnel Entry Control**
    - *How do you control who enters and exits a facility?*

- **Material Control Systems**
    - *How to prevent contraband from entering the facility and keep precious resources in?*

- **Integration**
    - *How do the pieces work together?*


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Personnel Entry Control

All systems are based on one or more of the following factors

- Something you *have*
  - Key, card….

- Something you *know*
  - Personal Identification Number (PIN), password…

- Something you *are*
  - Photo, biometric….

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Something you *HAVE* - Badges

- **Most commonly used token for entry control purposes**

- **Manual systems - Photo on badge is verified by protective force guards**

- **Automated systems - Coded badges are read by badge readers**

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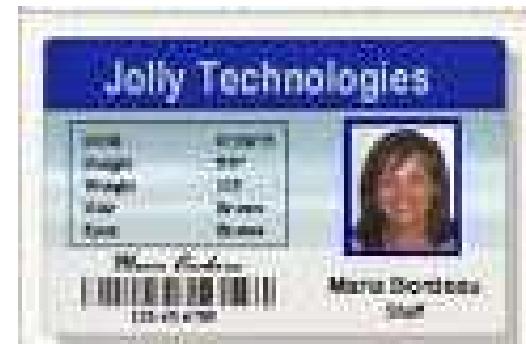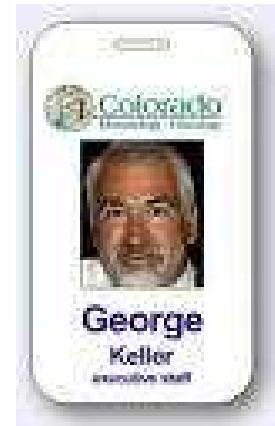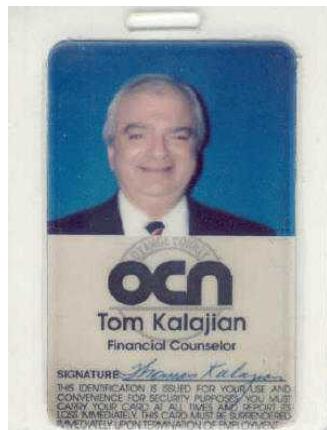
Coded Badges

- **Pros**
  - **Control access by area and time**
  - **Can be deactivated without having to physically retrieve the badge**
  - **Records each access**

- **Cons**
  - **Identify badge, not person**
  - **May be counterfeited**

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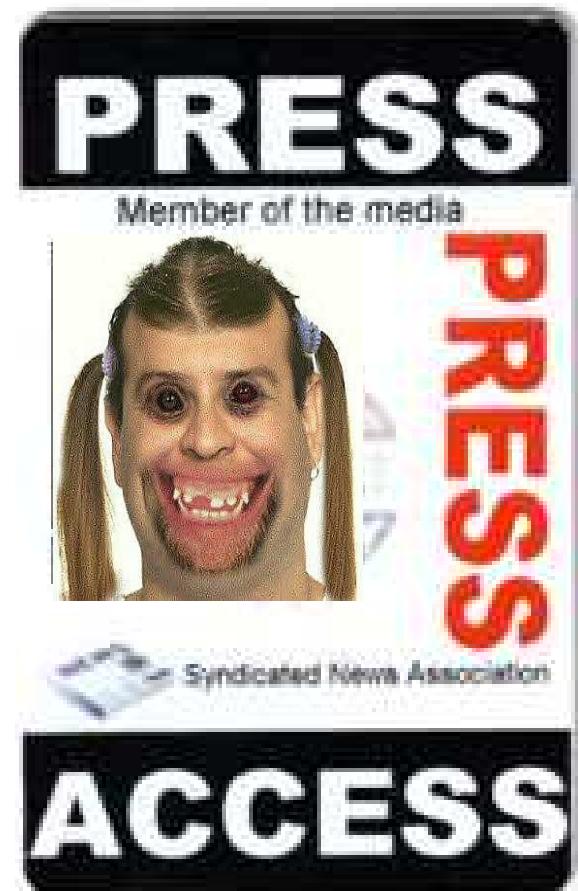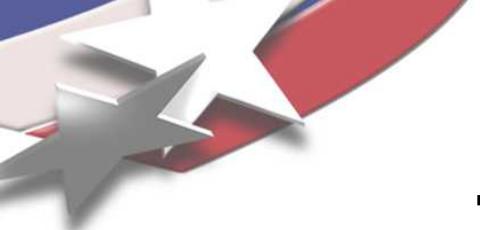
Types of Coded Badges

- **Magnetic strip**

- **Bar code**

- **Optical**

- **Proximity**

- **Smart card**
    - **Direct read**
    - **Proximity**
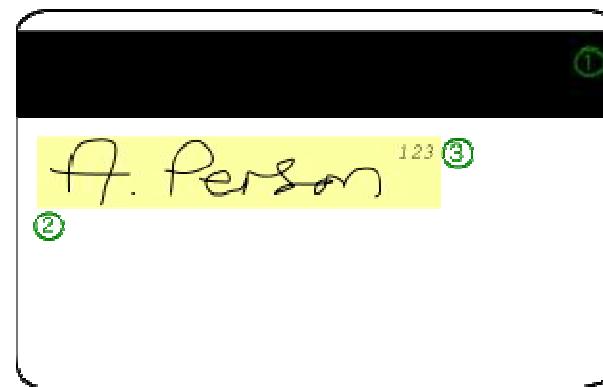
Coded Badge Design Considerations

- **Systems identify badge not person**
  - **Combine badge read with another factor such as PIN or biometric**

- **Mitigate counterfeit threat**
  - **Badge information should be verified against system database before allowing entry**
  - **Don't store PIN or biometric information on the badge**

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Coded Badge Design Considerations (cont.)

- **Require badges to be worn in plain sight on premises**

  - **Identify intruders who have bypassed entry control points**

  - **Counterfeit badges may become apparent**

- **Maintenance**

- **Test**

Something You *KNOW* - PINs

- **Must balance between the security desires for long, frequently changed numbers vs. the ability of users to remember and reliably enter the number quickly**

- **Design entry points to minimize opportunities for "shoulder surfing"**

- **Users should select their own PINs**

- **PINs should be protected**

Something You *ARE* - Biometrics

May be based on:

– **Fingerprint**

– **Handwriting**

– **Hand geometry**

– **Retinal pattern**

– **Iris pattern**

– **Voice**

– **Other**
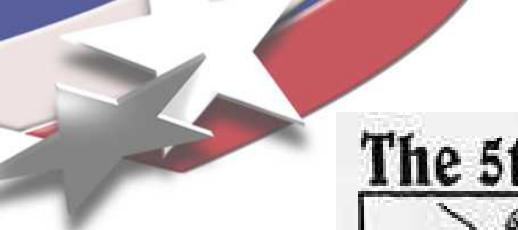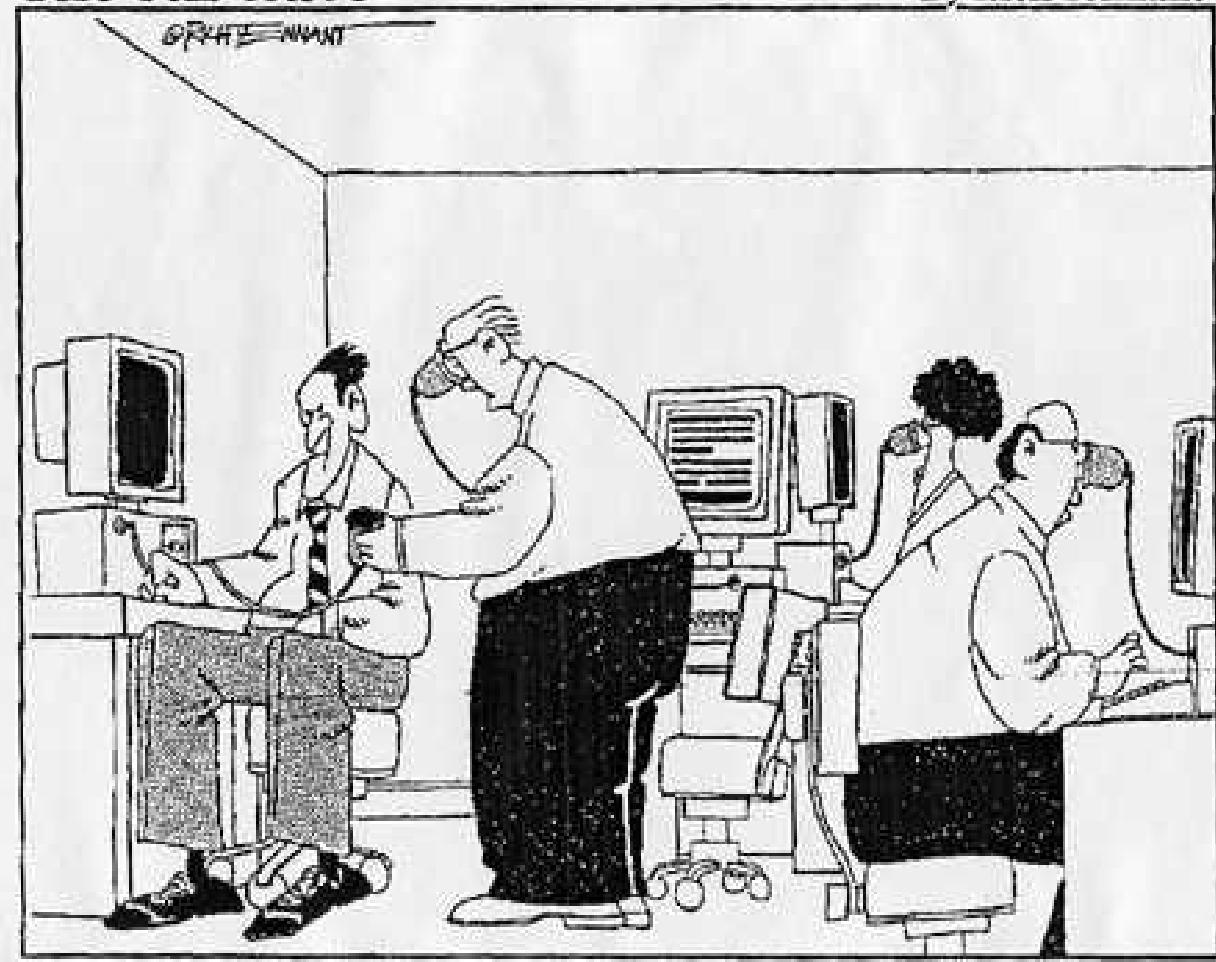
"C'mon Brickman, you know as well as I do that 'nose scanning' is our best defense against unauthorized access to personal files."

Biometric Operation

- **Enrollment**
  - One or more measurements encoded to form a template
  - Time required can vary from a few seconds to several minutes

- **Verification**
  - At entry portal, the requestor's template is retrieved
  - A measurement is made and compared against the template
  - If results of the comparison is below some threshold, a match is made and access granted
  - Time required can be as low as a few seconds

- **Recognition**
  - Some systems compare the current measurement against all of the templates in their database

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Error Rates

Fingerprint Scanner

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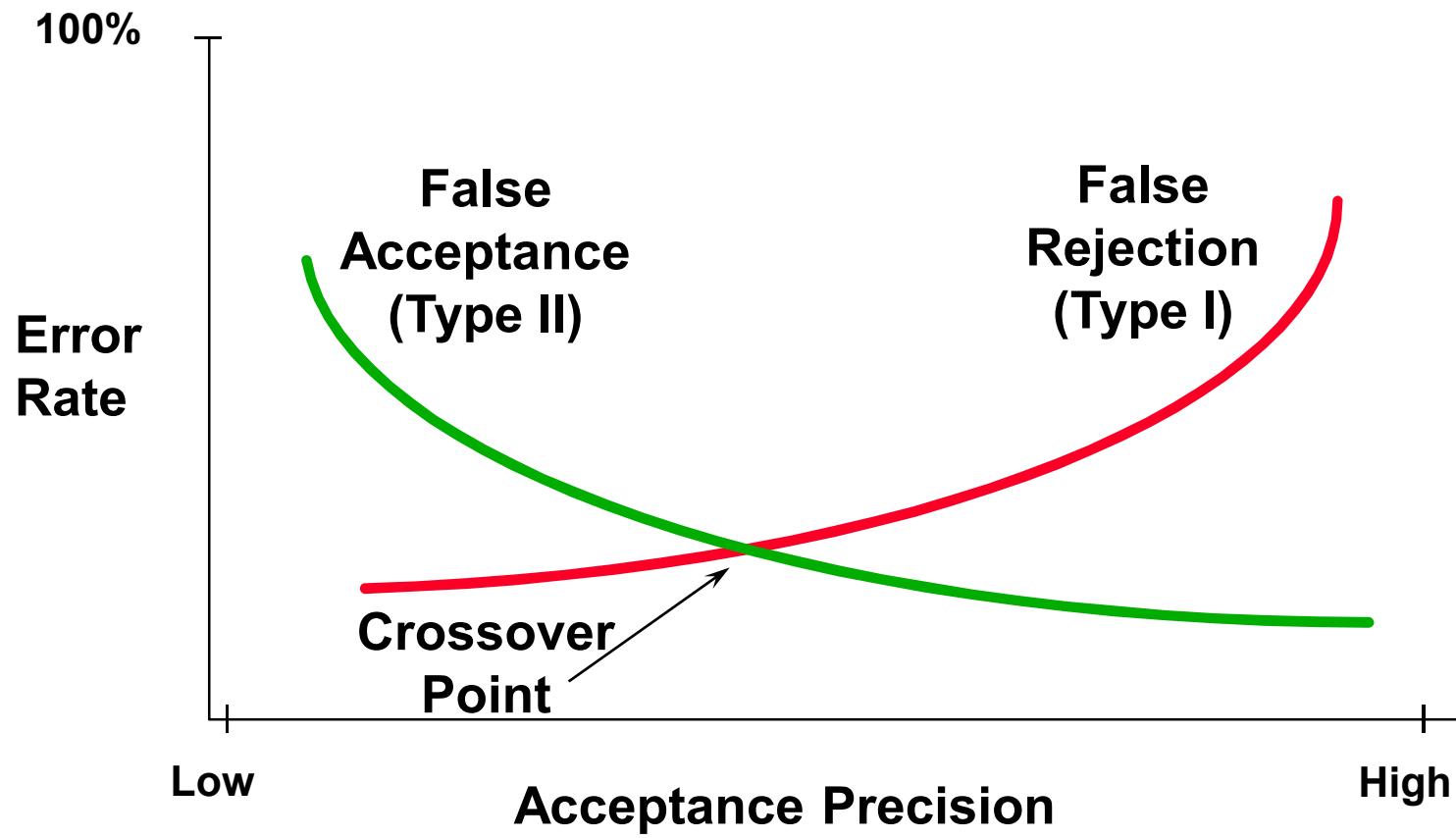
Handwriting Reader

Hand Geometry

Retinal Pattern

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Iris Pattern

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Voice Recognition

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Biometric System Considerations

- **Verification times**
    - **4 to 20 seconds**

- **Enrollment**
    - **1% to 3% of population is incompatible**
    - **20 seconds to 13 minutes required to enroll**

- **Cost**
    - **$1,000 to $7,000 per terminal**

- **Database requirements**
    - **Each device needs access to templates**
    - **Some systems update templates**

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Personnel Entry Control Summary

- **Purposes**
  - **Accept authorized persons**
  - **Reject unauthorized persons**
- **Protective force guards use comparison of photo image to person**
- **Machines use one or more of:**
  - **Coded badges**
  - **Personal identification numbers**
  - **Physical characteristics**

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Material Control

- **Prevent entry of**
  - **Weapons**
  - **Explosives**
  - **Other contraband**

- **Prevent unauthorized exit of**
  - **Critical assets**
  - **Special Nuclear Material**

- **Must screen people, packages, and vehicles entering or exiting security zones**

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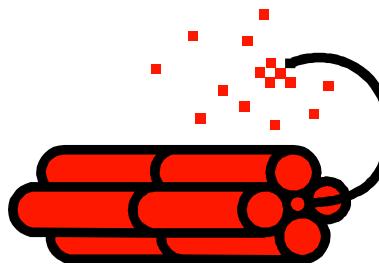
Material Control – Screening People

Methods available

- Metal detectors

- Trace explosives detectors

- Millimeter-wave whole-body imagers

- Backscatter X-ray imagers

- Manual search

- SNM detectors

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Metal Detection

- **Useful for detecting weapons on entry and possible shielding on exit**

- **Factors that affect sensitivity**
  - **Orientation**
  - **Ferromagnetic materials**
  - **Shape**

- **Types of detectors**
  - **Continuous wave**
  - **Pulsed field**

- **Installation and use**

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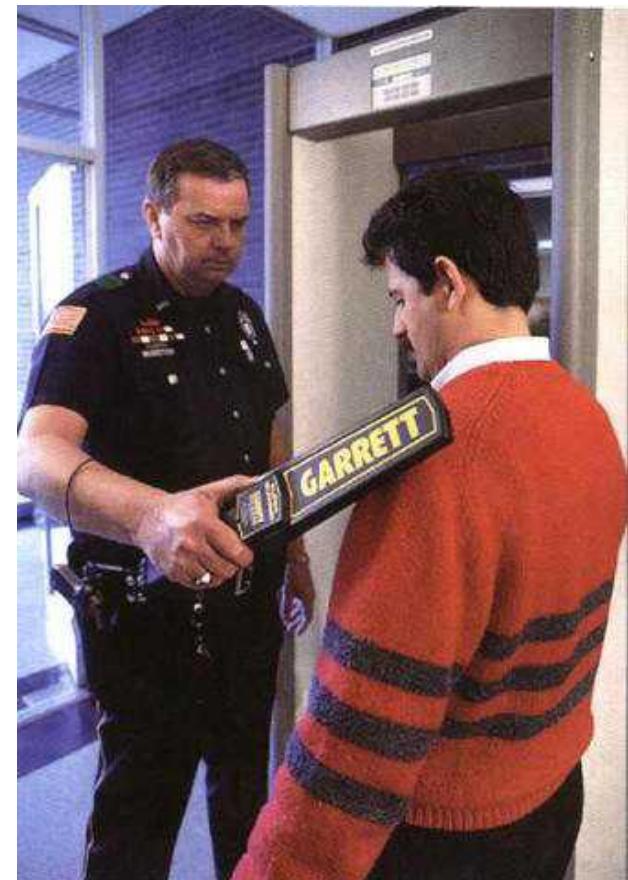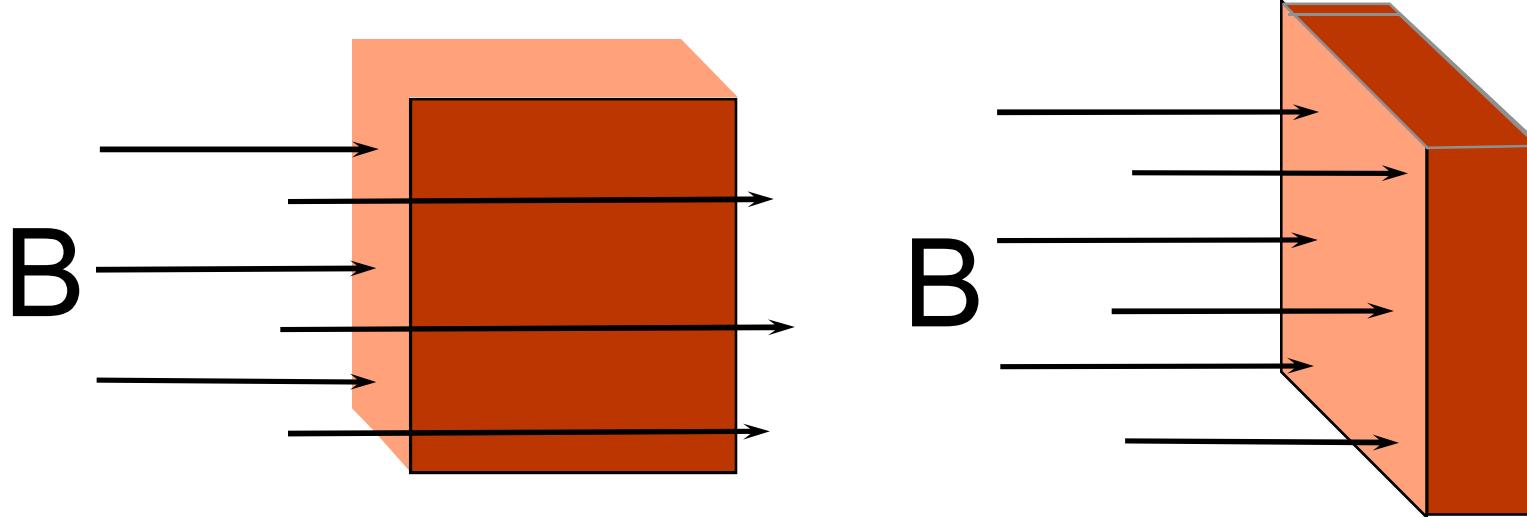
Orientation

The orientation of an object can change the cross-sectional area that is normal to the magnetic lines of flux

Ferromagnetic Materials
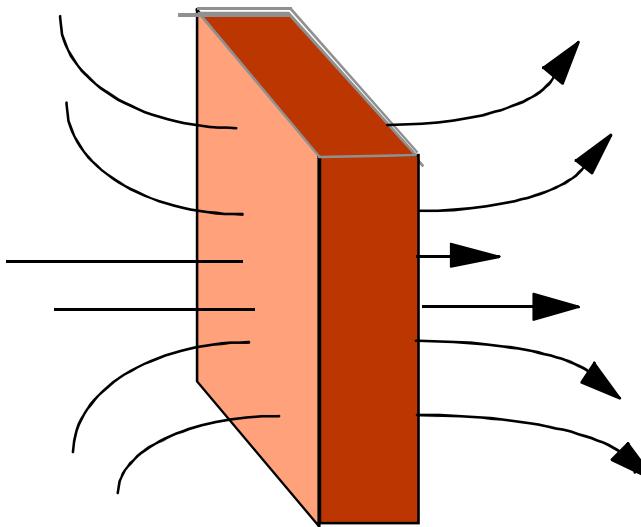
- **By providing a path of lower reluctance than the surrounding medium, ferromagnetic materials distort the magnetic field**

- **By intensifying the magnetic field within their volume, ferromagnetic materials have a higher induced voltage than other materials**

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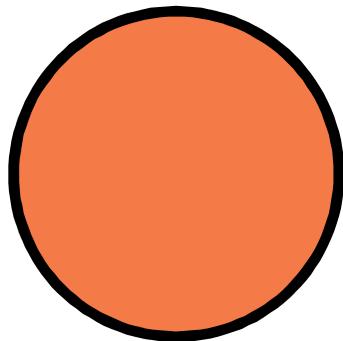
Shape

Two shapes of the same material have equal areas. The 9 sq. in. circle has a circumference of 10.63 in.; the 9 sq.in. (9x1 in.) rectangle has a perimeter of 20 in. The resistance of the rectangular path is almost twice as high as the circular path. *The result is that the circle is easier to detect.*

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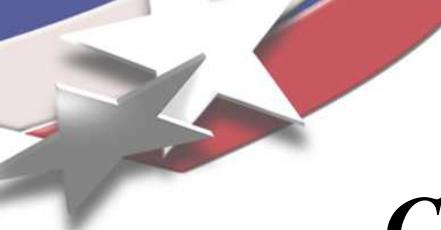
Coil Geometry for Typical *Continuous Wave* Metal Detector

Receiver Coils

Transmitter Coil

Direction Of Travel

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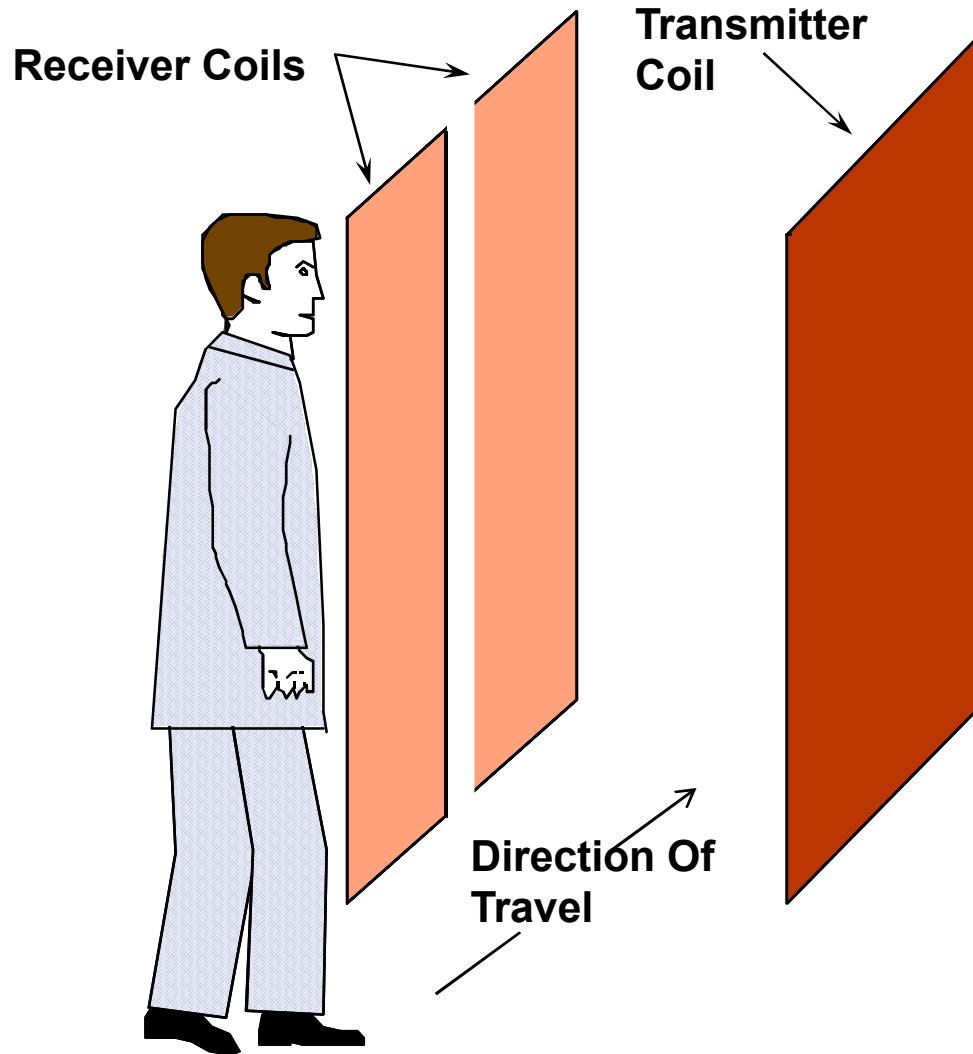
Coil Geometry for Typical *Pulsed Field* Metal Detector

Receiver Coil

Transmitter Coil

Direction Of Travel

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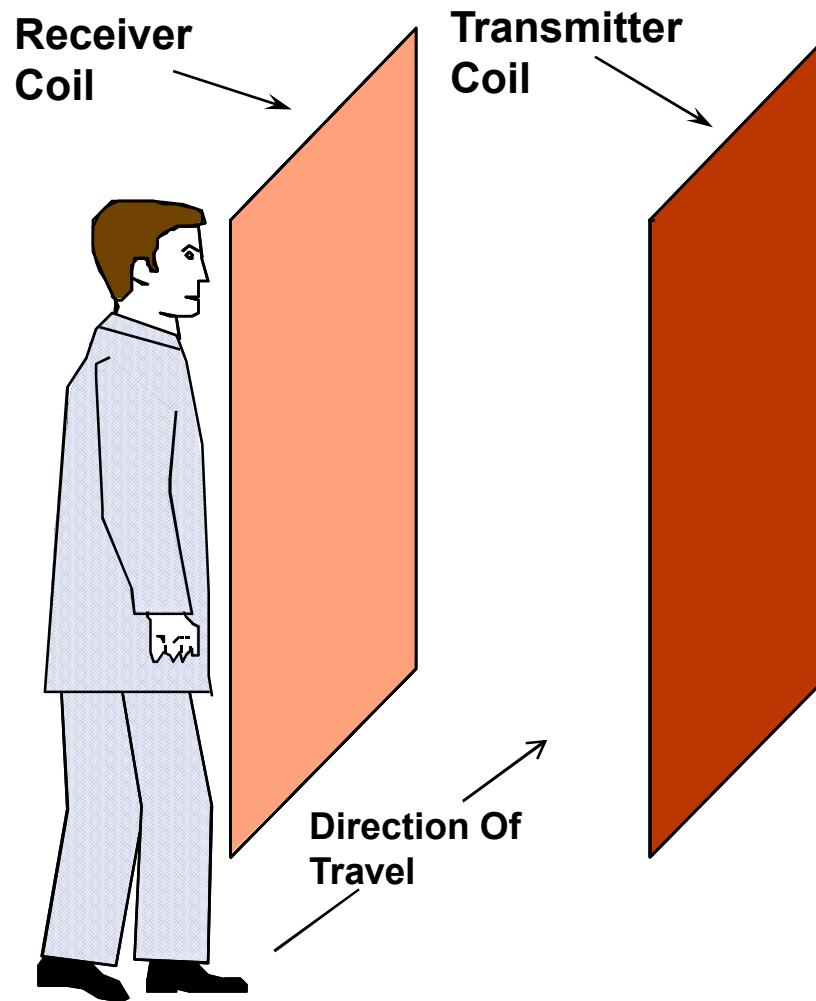
Factors Affecting Metal Detector Operation

- **Environment**
  - **Metal doors**
  - **Metal cabinets**
  - **Equipment operating nearby (example: fork lifts)**
  - **Electromagnetic sources (example: radio transmitters, fluorescent lights)**
- **Type of metal**
- **Size and shape of object**
- **Orientation of metal object**
- **Location of metal object**

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Trace Explosive Detection Portal

Vapor and particulate sample is collected from the person in portal

Sample is *pre-concentrated* **and delivered to Ion Mobility Spectrometer (IMS) for analysis**

Ion-Molecule Reaction Region   **Drift Region**

8 cm.   10 cm.

200 cc/min

Electron Source

700 cc/min

500 cc/min

Farada Plate

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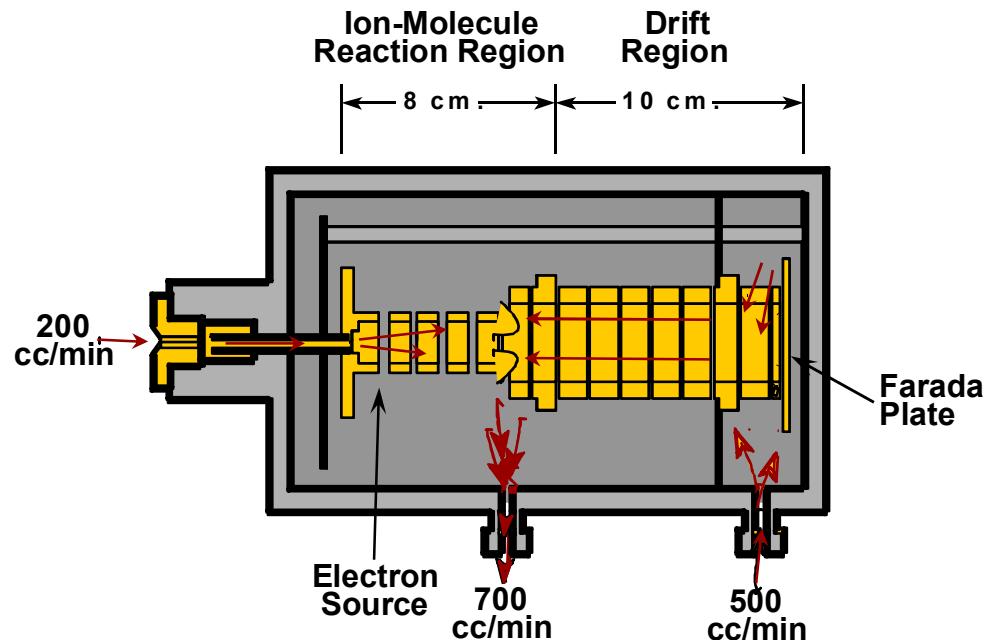
Personnel Backscatter X-ray Scan

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Active Millimeter Wave

- **Highlight changes in density below clothing**

- **Operator examines image to decide if threat objects exist**
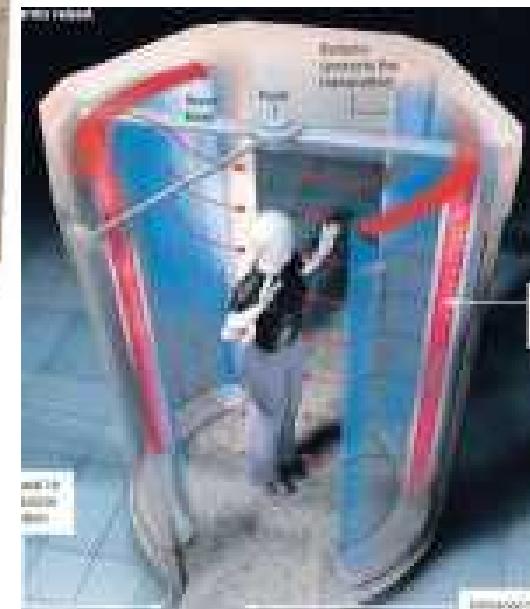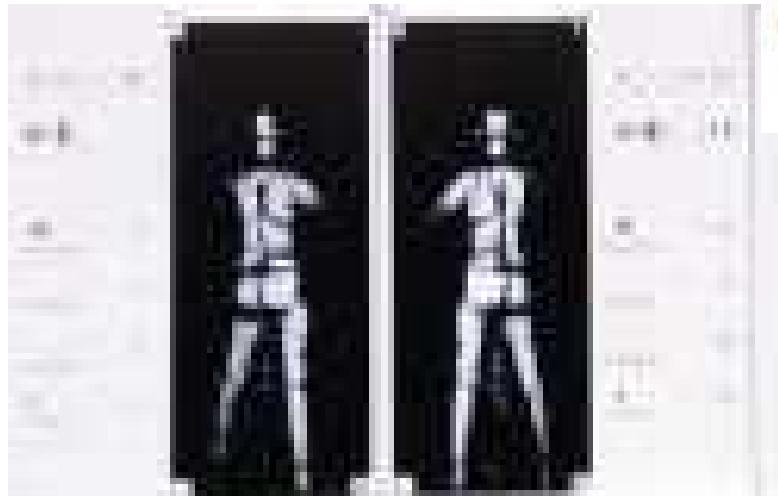
Screening People for Contraband
– Summary –

- **Metal detectors are useful for finding shielding and weapons**

- **Trace techniques can screen for explosives**

- **Imaging techniques can help find hidden objects**

- **All alarms must be fully resolved**
  - **Not enough to discover the belt buckle, must rule out the presence of a weapon**

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Material Control - Packages

Methods available for screening packages and vehicles

- **Trace detection**
  - **IMS**
  - **Dogs**
- **Bulk detection**
  - **X-ray**
  - **Thermal neutrons**
- **Manual inspection**

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Trace Detection

Sample is collected via swipe or vacuum and analyzed with IMS

Pros

- **Fast, efficient**
- **Detects many types of contraband**

Cons

- **Sample must be available to be detected**
- **Not all threat compounds can be detected**
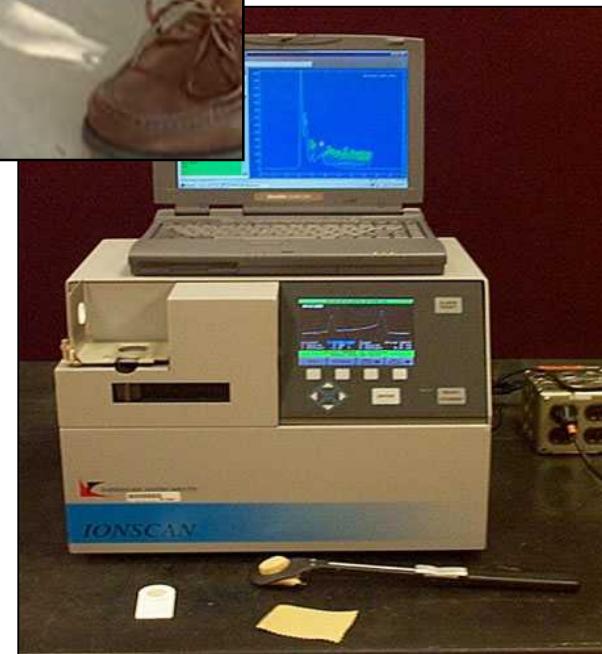
X-Ray Package Search System

TV or Computer Monitor

X-Ray Generator

Control Panel

Package

Conveyor

Digital Video Storage

Photo Diode Array Box

Electronics Chassis

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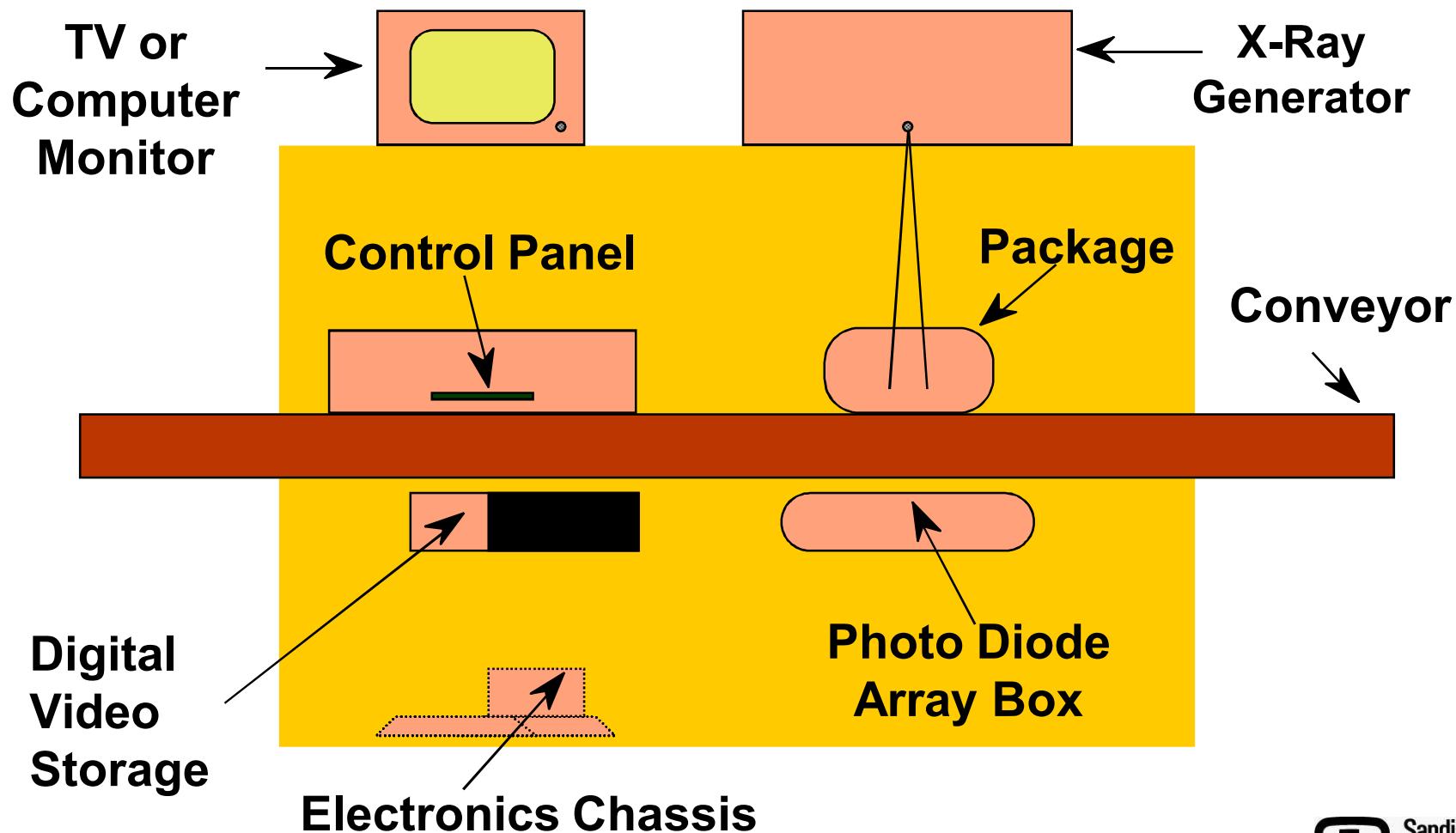
Backscatter Package Search

Transmission   **Backscatter**
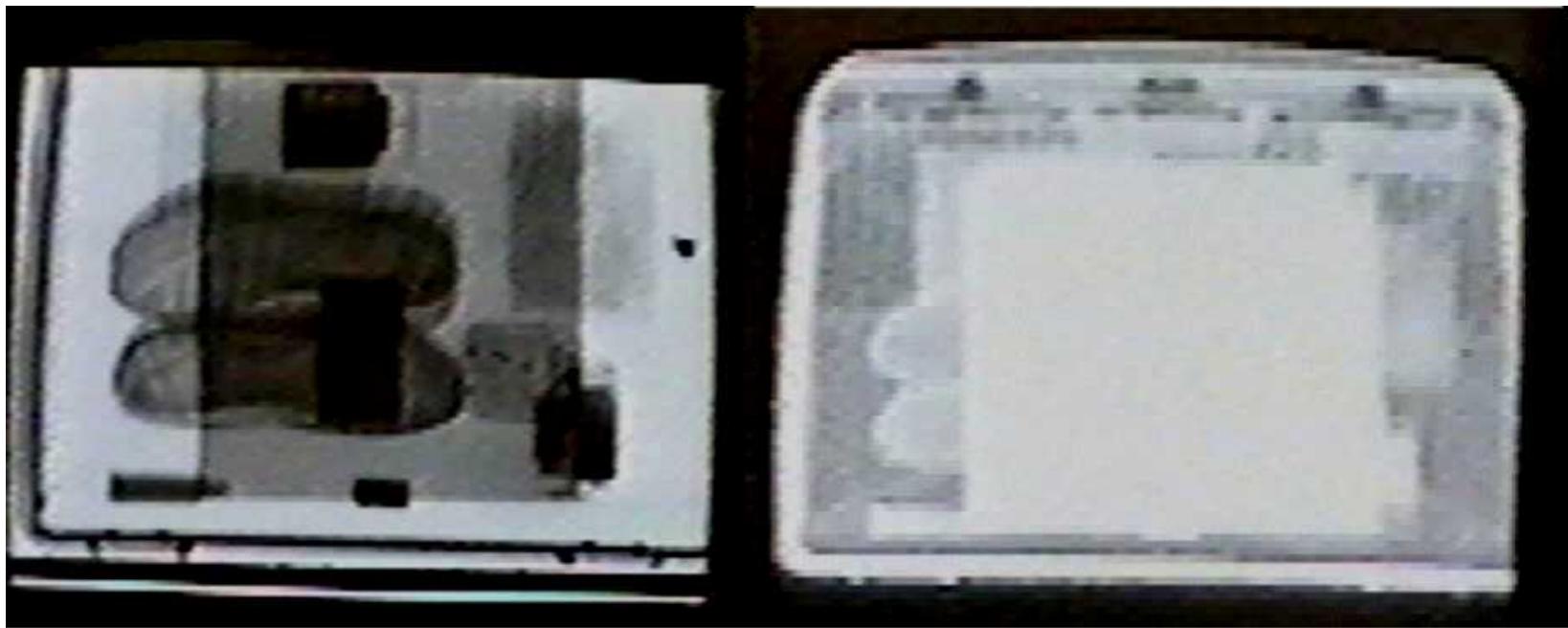
Dual Energy X-Ray
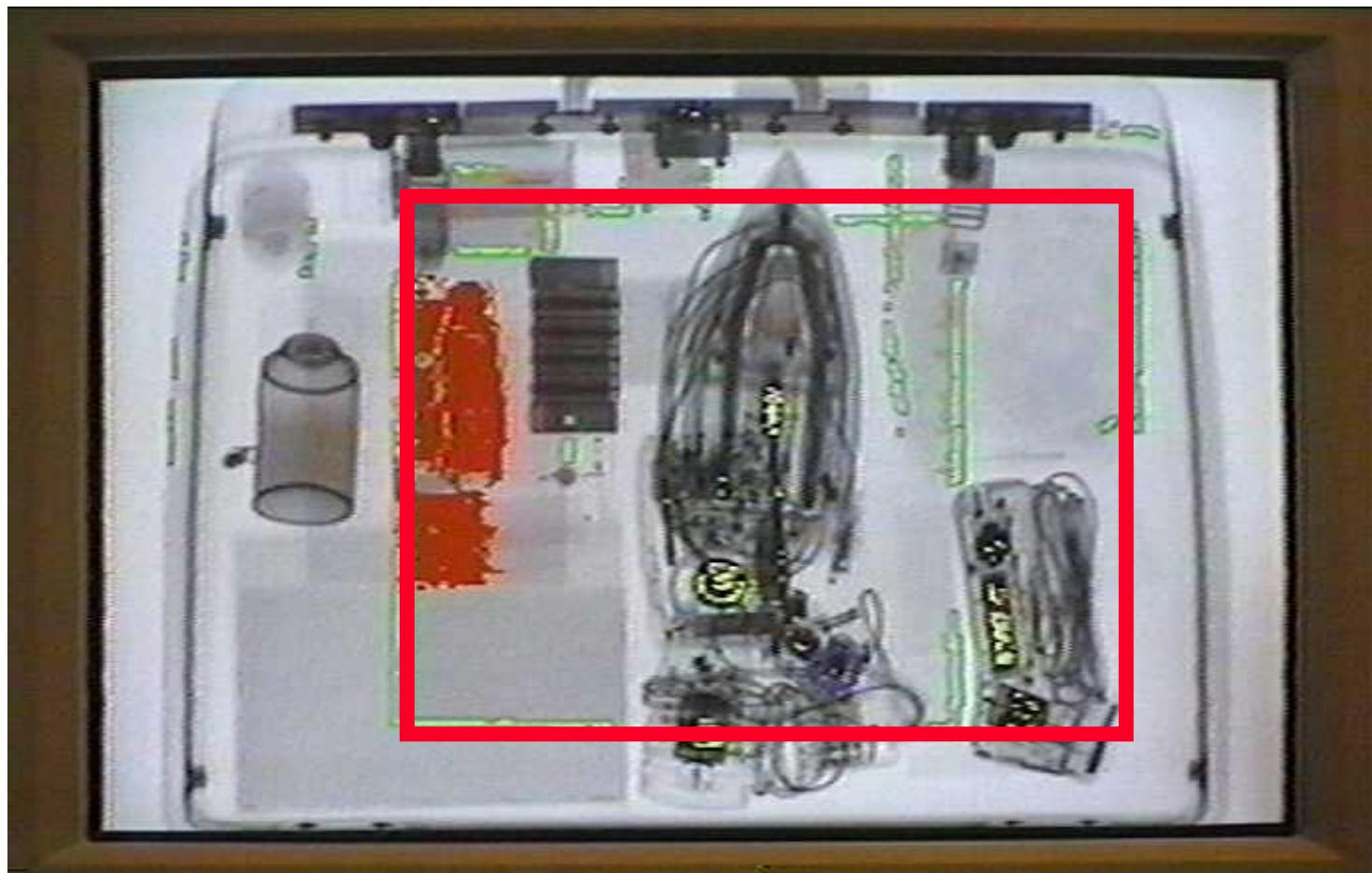
Computed Tomography (CT)
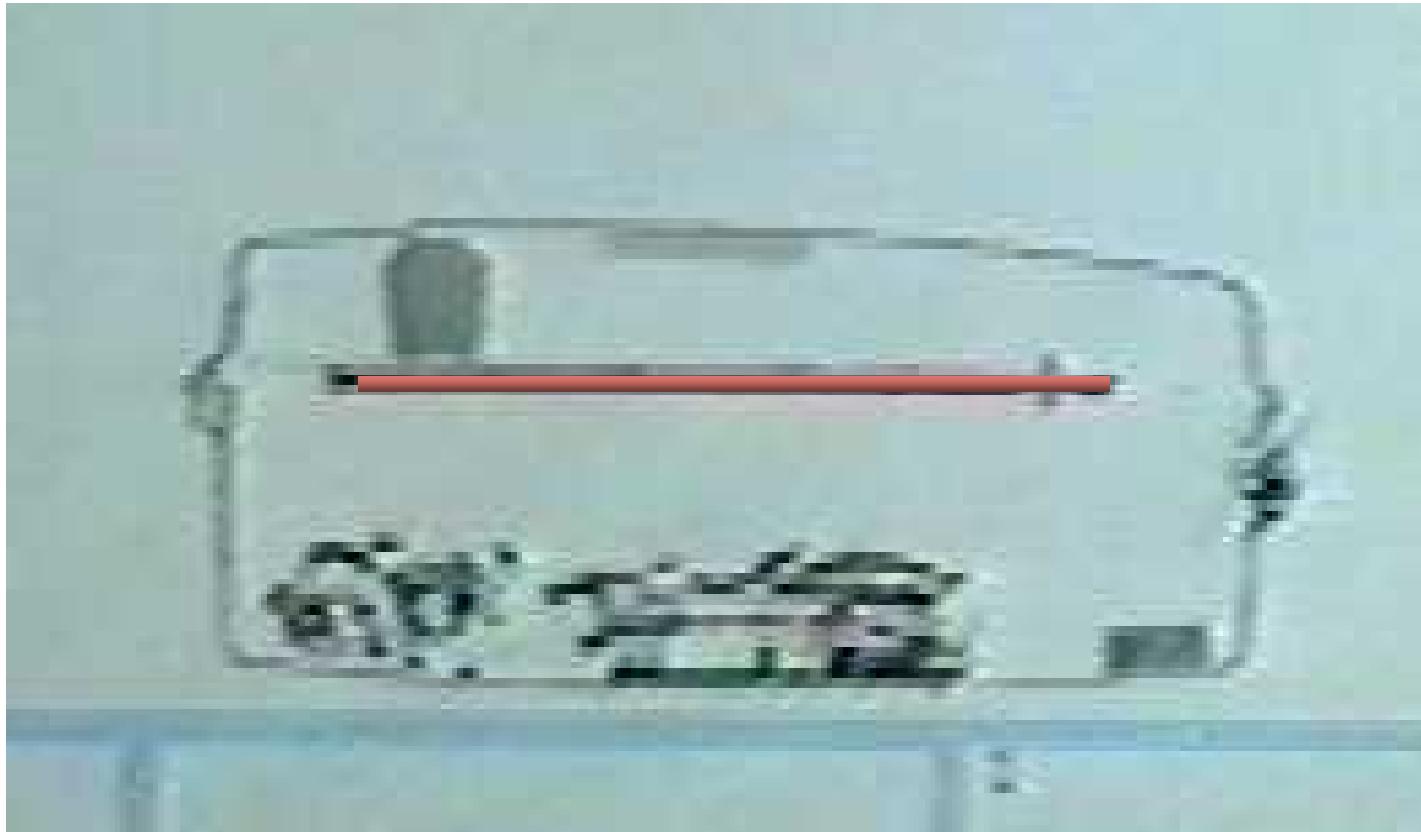
Single slice with red indicating threat material

Rapiscan Portal

- **Thermal neutrons interrogate vehicle**

- **Can determine the presence of nitrogen**

- **Some cargoes can create false positives or false negatives**

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Package Inspection – Summary

- **Many techniques exist**

- **There is no** *"Tricorder"*

- **No one technique or technology can be used to screen for all threats**

- **Using multiple complementary techniques can improve probability of detection and reduce false alarm rate**

Special Nuclear Material

- **Screening required for people and packages exiting MAAs**

    - **Vehicles generally not allowed in MAAs or controlled through administrative means such as continuous escort and two-person rule**

    - **Must be consistent with isotopes on site and other screening steps such as metal detection or X-ray inspection to detect shielding**

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Integration – MAA Personnel Portal Example

Item Pickup/Dropoff,
Hand-Carried/Outer Clothing

Inside MAA

X-Ray Inspection (Optional)

Turnstile for Entrance to and Exit from MAA (2 Way)

Ballistically Hardened Wall, Door, and Viewing Windows

Biometric, Badge, and Pin Reader

SNM Detection (Exit Only)

Guard Station (2 Guards Posted at all Times)

Metal Detection Portal (Entry and Exit)

Guards can lock/unlock any of the doors at any time by pushing a button from this location

Enter/Exit Door to Screening Area

Outside MAA

Request to Enter Button

Item Dropoff/ Pickup, Hand-Carried/Outer Clothing

Sample Personnel Entry screening Layout
of Screening Program Features for a Materials Access Area

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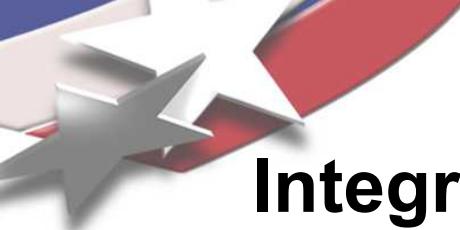
Integration – PA Vehicle Portal Example

Vehicle Inspection Area

Gate #1 Entrance to Vehicle Inspection Area

Bollards and Cable

Vehicle Pop-Up Barrier

Gate #2 Entrance to Protected Area

Passage Gate #1 for Vehicle Operator

Entry Control Operation Area (Guard Station)

Personnel Entry Screening Area

Screening Area Entrance

Exit from PA

Outside Protected Area

PA Boundary

Inside Protected Area

Passage Gate #2 for Vehicle Operator

Sample Layout for Vehicle and Personnel
Entry Screening for a Protected Area

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Integration Issues

- **Bypass**
  - Portals designed to prevent bypass of screening steps
  - Intrusion detection system should ensure that entry portals are not bypassed altogether
  - Barriers, sensors, and distance can work together to prevent contraband from bypassing entry portals by means like throwing over fences

- **Monitoring**
  - Entry portals should be monitored by central alarm station
    - Unauthorized entry
    - Tampering with security systems
    - System or component failure
    - Duress alarms
  - Portal itself shouldn't create opportunities for bridging or bypassing intrusion detection sensors

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Integration Issues (cont.)

- **Secondary Screening**
  - Facilities and procedures for resolving alarms
  - All alarms should be resolved and possible threats masked by nuisance alarms should be examined
    - Ex: small gun hidden behind metal belt buckle
- **Fail Secure**
  - Components should be designed to fail in secure mode
  - Designs shall not compromise safety
- **Systems protection**
  - Control hardware and data cables should be located on the secure side of barriers
- **Integration with AC&D**
  - The entry control system can change the status of alarms or zones from secure to access status
- **Throughput**
- **Isolated Network**
  - No links to networks outside of the security system

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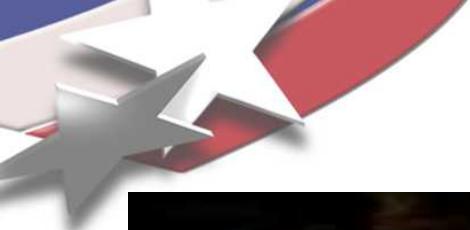
Entry Control System Summary

- **Control people and materials crossing security area boundaries**

- **Designed to handle traffic entering and exiting**

- **Must work in concert with the rest of the security system**

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