

NUCTECH COMPANY LIMITED 

SIAS 2014, Canada

# NEW TECHNOLOGY IN AIR CARGO DETECTION



# 1. THREATS in AIR CARGO SECTOR



2010 Yemen Incident

## DIVERSIFIED THREATS

- Explosives
- SNM
- Narcotics
- Weapons
- Tobacco
- Alcohol
- Other prohibited items



## 2. UNIQUE CHALLENGES



- ❖ Small fraction of global air cargo is actually screened
- ❖ “Screening” practices vary
- ❖ Specific requirements unattended

- ❖ Highly variable by content, size, and shipment volume
- ❖ Deconsolidation highly impractical
- ❖ Time sensitive cargo flows
- ❖ Unique challenges unaddressed

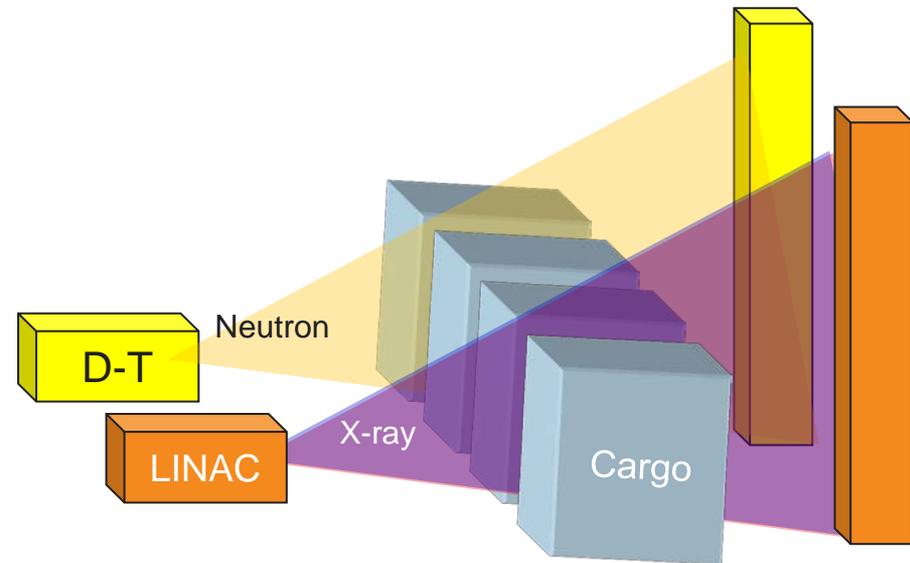


# 3. TARGET SOLUTION



## 4. Our approach –FINDEX

- **F**ast **I**nterlaced **N**eutron and **D**ual-**e**nergy **X**-ray Imaging technology
  - Collect high resolution neutron and X-ray radiographic images
  - X-ray data provides information about density of material in beam
  - Neutron/X-ray interaction cross-section ratio provides information about the average composition of the material in the beam
  - More sensitive than dual-energy X-ray approach

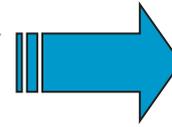


# 5. FINDEX in Theory

Transmission

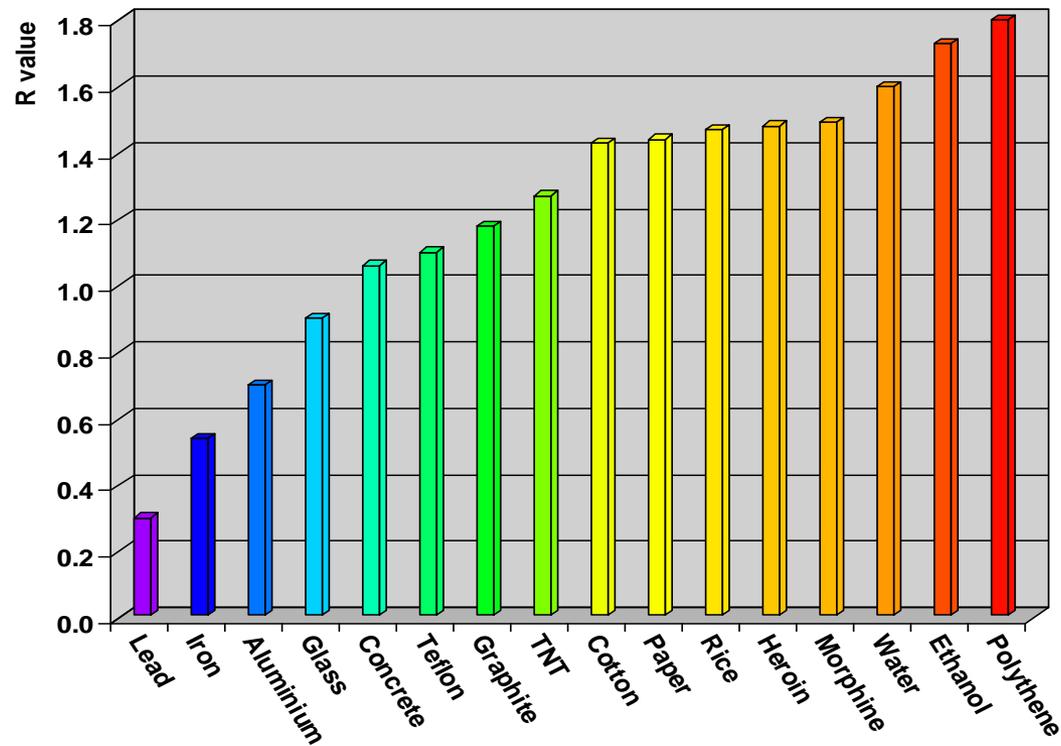
$$\frac{I^x}{I_0^x} = e^{-\mu_x \rho x}$$

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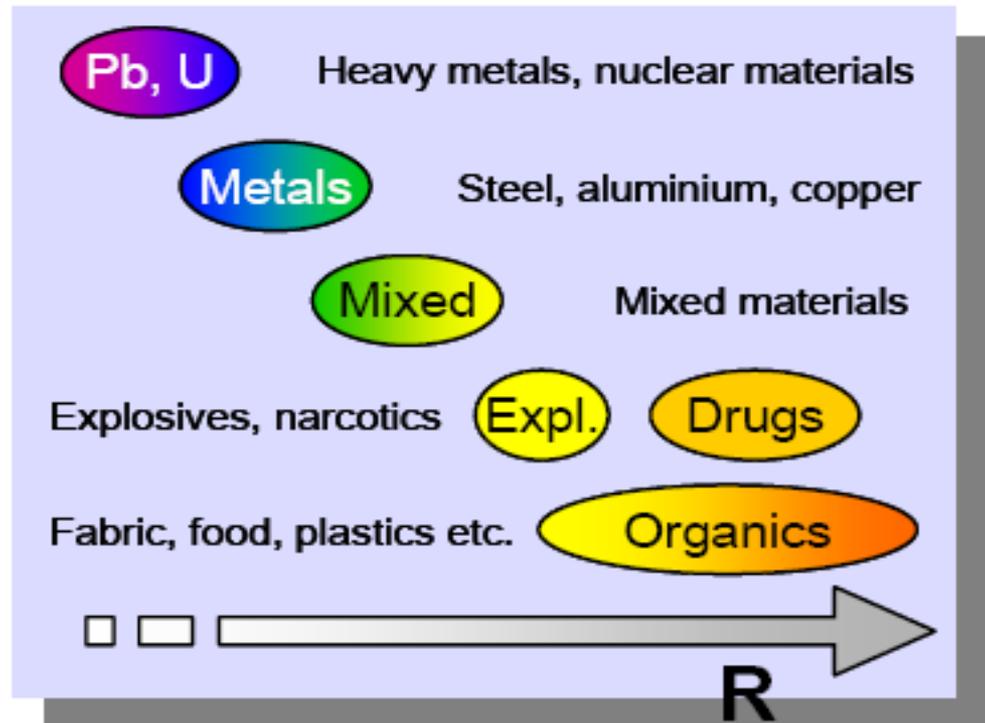
Composition

$$R = \frac{\mu_n}{\mu_x} = \frac{\ln(I^n / I_0^n)}{\ln(I^x / I_0^x)}$$



## 6. Strengths of FINDEX

- Improved materials discrimination capability based on material composition and density
- Particularly high sensitivity to organic materials, such as concealed explosives and narcotics



# 7. From Concept to Reality

- Utilizing commercially available radiation sources

**6/3 MeV LINAC**

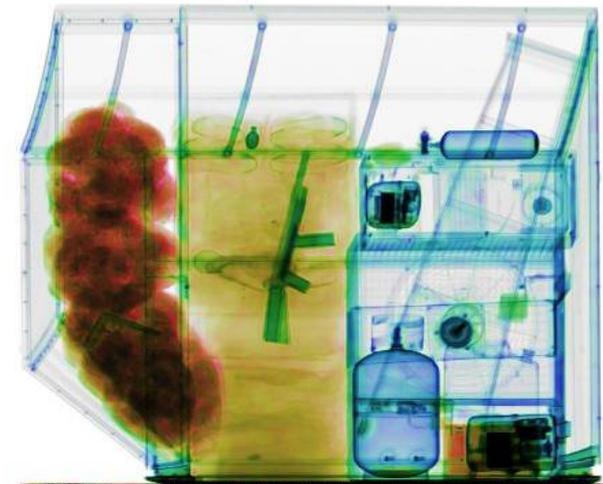


**14 MeV Neutron Generator**



## 8. From Concept to Reality

### Air Cargo Scanner



# 9. Looking into the Future

