Enhanced Decision-Making and Operational Efficiency for Customs using AI and ML analytics powered by data-rich 3D Muon Tomography

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Session A2
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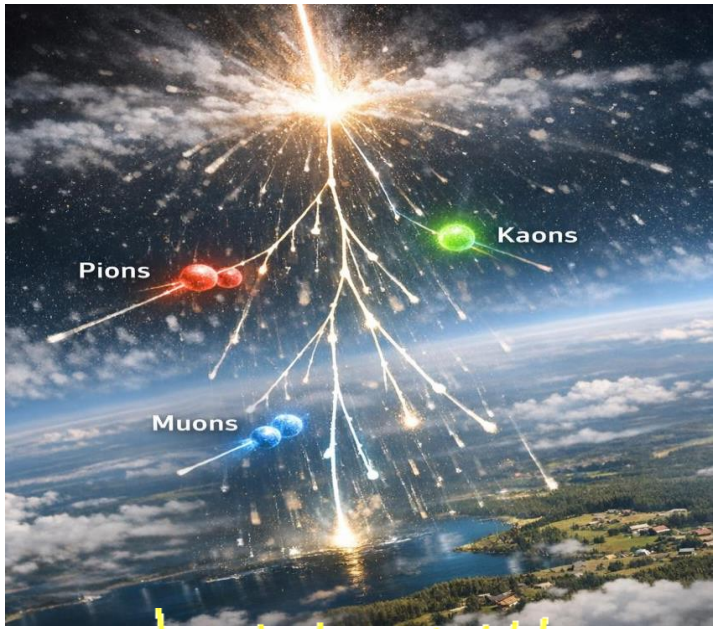
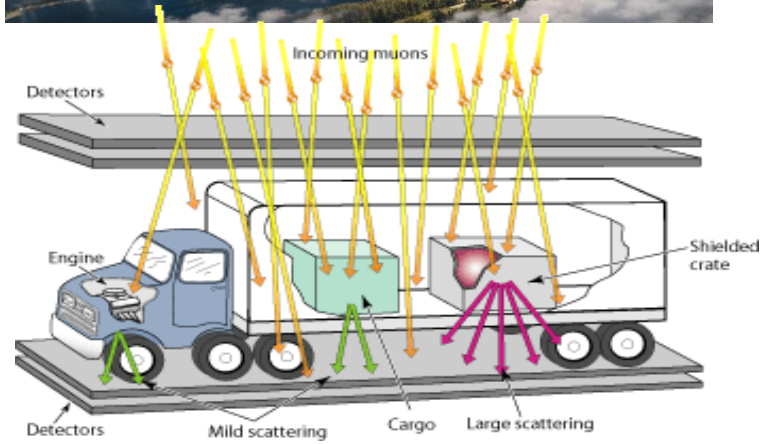
Decision Sciences®

RECAP – MUON TOMOGRAPHY OR “COSMIC RAY” TOMOGRAPHY





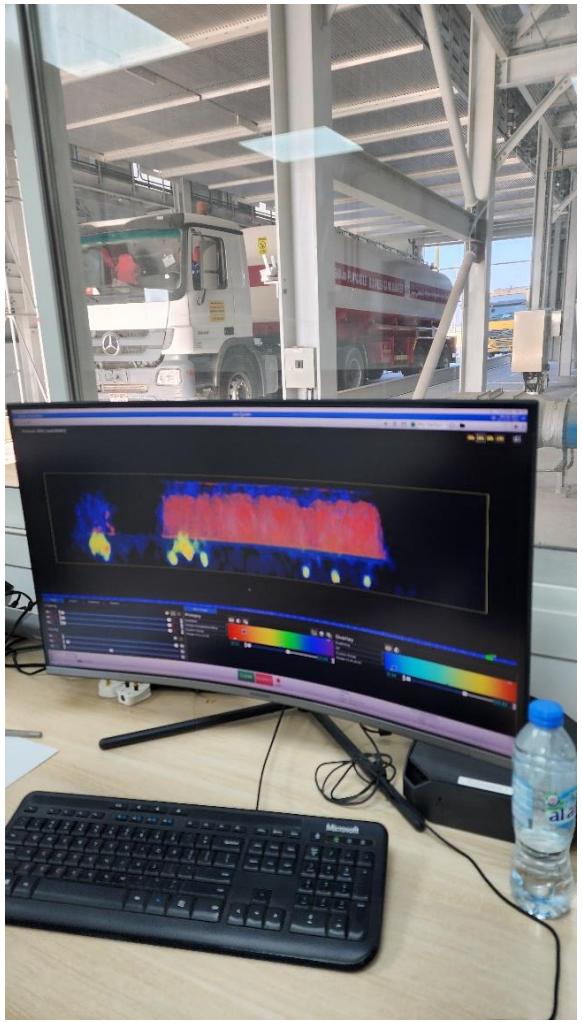
Cosmic rays mainly consist of high-energy protons travelling near light speed through space.

These Protons originate from “Cosmic events” such as supernova explosions.

On colliding with the Earth's atmosphere, they shatter into cascades of secondary particles

These secondary particles decay into muons and electrons,

As these particles track through the detectors and the “Object under inspection” we reconstruct through Algorithms/ML and AI o produce 3D Imagery in under 3min.



Deep Learning In Muon Tomography

- DL algorithms are at the heart of a Muography system, enhancing imagery and highlighting anomalies to simplify the Operator's job.
- DL models are trained on proprietary datasets, collected and labelled
- The Discovery® Muon Tomography systems embed Deep Learning (DL), a class of machine learning algorithms that use Convolutional Neural Networks (CNNs) to generate predictions.
- DL Techniques and Applications include:
  - Image Segmentation.
  - Image Acceleration.
  - Anomaly Detection with Automated tools.

How Is The Decision Making Enhanced ?

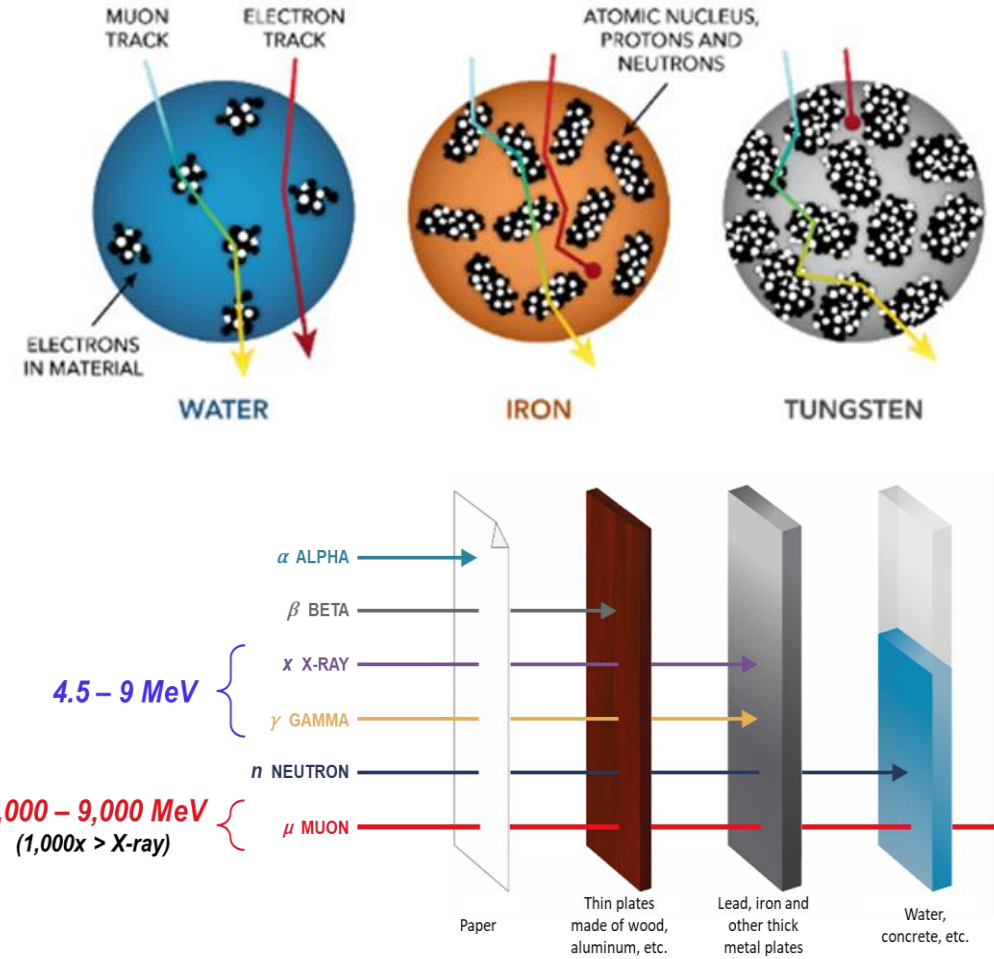
Muon Tomography uses reconstruction algorithms and integrated AI/ML to track the difference in the scattering of the **charged particles (muons and electrons)** as they move through objects.

- Whereas High Energy X-Ray cargo inspection systems rely primarily on differential attenuation due to the effective Z (Zeff) of the material which they pass thereafter producing a **2D Image**

Muon tomography produce 3D imagery based on the Bulk density as well as the atomic composition of the material and target under inspection

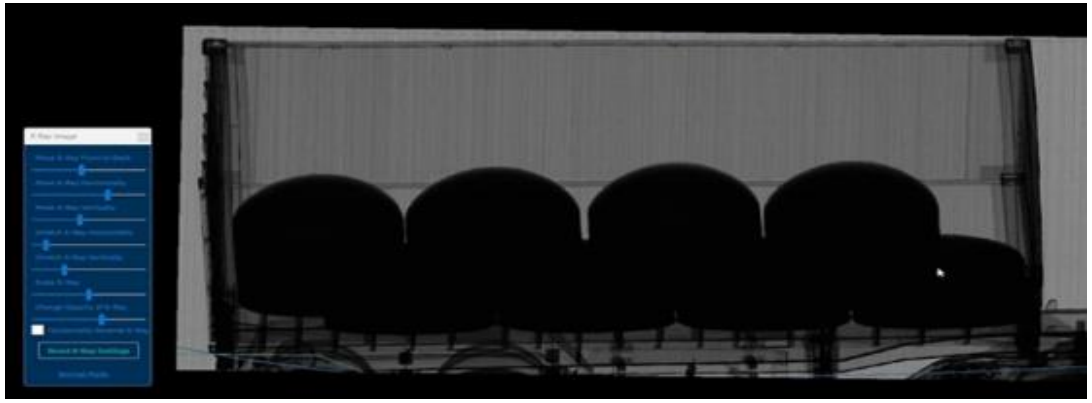
This facilitates – Comprehensive Image reconstruction and ATR (Automated Threat Recognition)

"Muons - Unparalleled penetration"



How Is The Operational Efficiency Improved ?

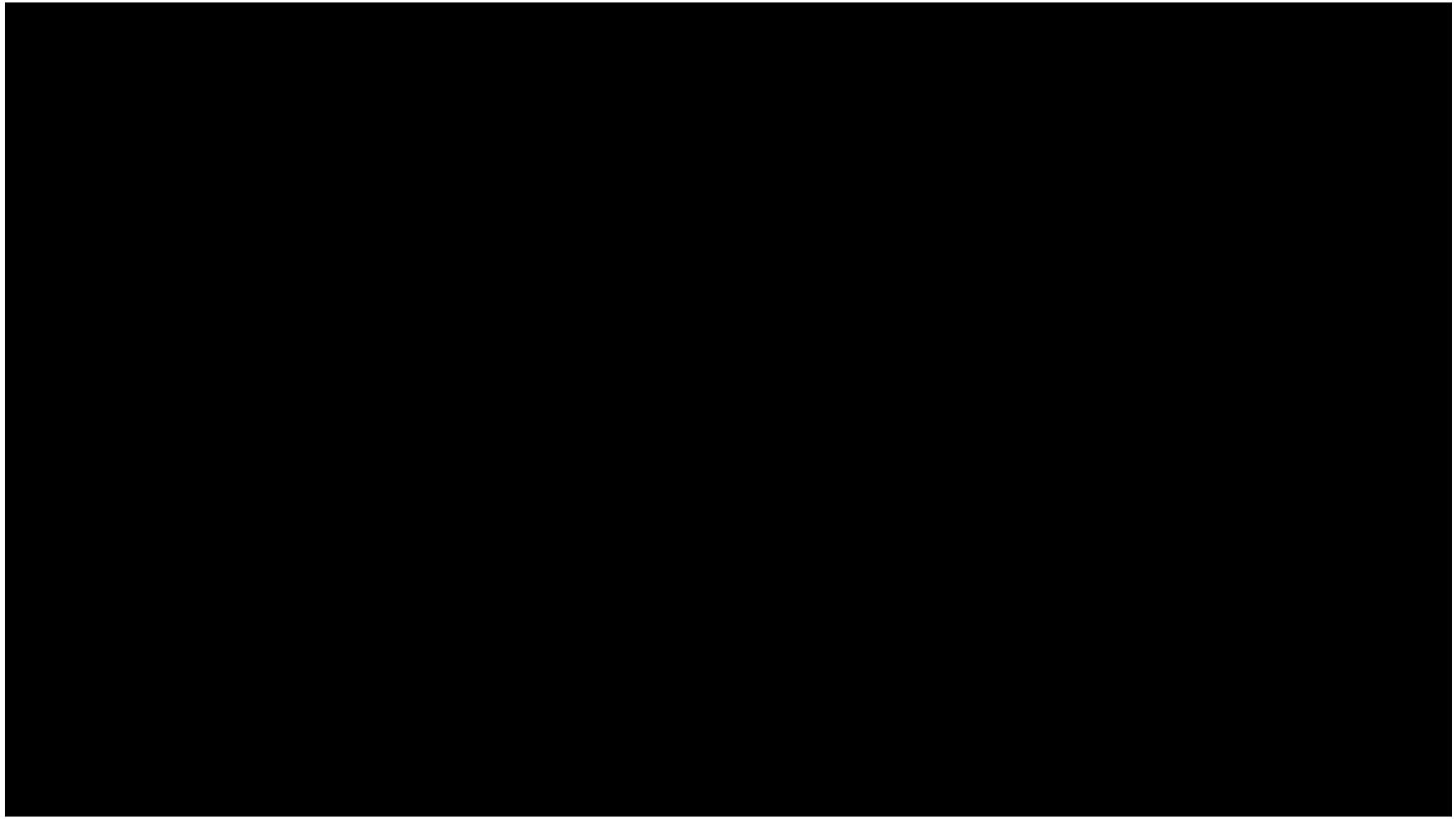
6 MeV X-Ray Imaging System



Discovery® (see video)

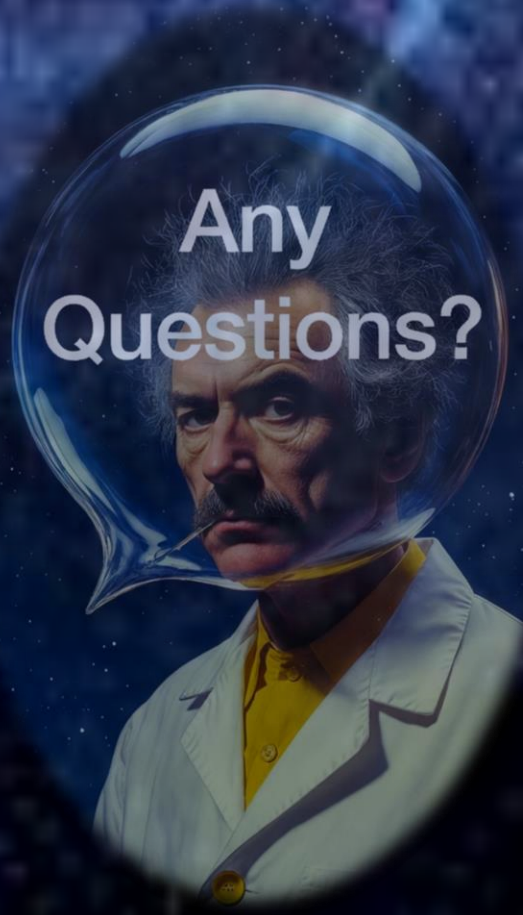
- Fills a Known and Exploited Gap – DENSE CARGO – This limitation leaves the officer with only a large black region on a 2-D image.
- **Superior penetration -** gives new insight in scanning dense cargo.
- **Full 3-D imagery -** A new Perspective.
- Discovery® picks up where x-ray leaves off.
- No moving parts: high operational availability and Lower TCO

Summary & Bringing it Together (Video)



Summary & Bringing it Together

- Muon Tomography leverages *naturally occurring* particles for inspection, meaning it is **100% safe**, producing **ZERO** harmful radiation, with **no requirements** for radiation protection infrastructure or associated Radiation regulatory body approvals.
- Discovery® is the only available imaging technology capable of detecting shielded Special Nuclear Material (SNM).
- Muon Tomography in NII is a unique inspection technology *available today* with **unparalleled penetration** and **3D imaging** capabilities, enabling inspection of the densest cargo sets where HE X-ray cannot see.
- **No moving parts:** high operational availability and Lower TCO – Low power, Sustainable
- Integration of **Deep Learning algorithms today** is providing ever-growing and useful capabilities from Muography systems including:
  - Image Segmentation
  - Accelerated Imaging
  - Volume Of Interest / Anomaly Detection
  - ATR (Automated Threat Recognition) tools.



SEE US on Stand P2

Decision Sciences International Corporation (DSIC) is an applied technology company that combines proprietary Artificial Intelligence (AI) and Machine Learning (ML), advanced physics and data aggregation, centered on its exclusive Charged Particle (Muon) Tomography technology and unique Discovery® NII system.

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