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Augmented X-Ray (AXR) – A game Changer for "Qualitative" Image Analysis

"Enhances the Probability of Detection"

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AGENDA

→ **What is Augmented X-Ray (AXR) ?**

→ **What Can AXR Deliver ?**

→ **Object Location & Material Supresion**

→ **AXR Stream of commerce Environment**

→ **Summary & Conclusions**

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Hardware Configurations

What is Augmented X-Ray (AXR) ?

An "ADVANCED DETECTION" Capability

- Provides exceptional high quality and quantity of X-ray image data.

- Critical information can be extracted from the data to support fast and accurate image analysis – Either by an Operator or by a AI / ML Algorithm.

- **Combination** of advanced "Physics Package" hardware configuration and software / data image processing and manipulation.

From Low frequency non configurable LINAC Sources: To:-
- High Frequency (≤ 1KHz) Highly configurable LINAC
- Small pitch, multi array Detectors
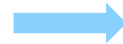
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What can AXR Deliver ?

A substantial improvement in radioscopic image quality = New image-processing algorithms:

- Images with significantly enhanced resolution and almost eight times as many pixels.

- As much as 60 times more data captured from each scan. 50% increase in image resolution in both vertical and horizontal planes.

  - AXR technology uses colours to highlight the location of objects within a container, thereby facilitating object identification.

  - The ability to discriminate between different materials is enhanced. The ability to **"suppress"** certain materials means that identification of target materials can be improved so that they can be recognized at first sight

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Object Location Tools

1. **Depth Information** – Pinpoints areas of interest:

- Provide operators with better object positioning and depth information – Able to identify whether a specific object is located at the **near** (LINAC side, red), in the **middle** (green), or on the **far** (**detector side, blue).** of a container/cargo.

- This improved perception of an object's depth and position within a container means a substantial improvement in detection capabilities.

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Material Suppression Tools

2. WALL REMOVAL "GETS STRAIGHT TO THE POINT"

- Remove steel container or vehicle walls from the X-ray image to highlight organic materials throughout the entire screening area irrespective of depth location. Organic materials are unveiled and displayed in bright white. Visible through around 10cm

  - With such exceptional penetration, organic materials are revealed regardless of depth position inside the screened vehicle or container and with an unlimited field of view. This represents a major advance which far exceeds the 'backscatter' principle and yet does not require additional hardware.
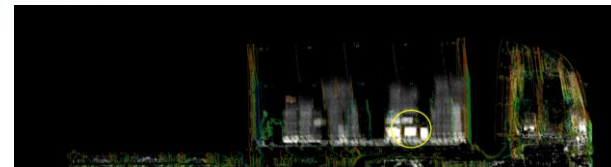
Normal High Energy Image
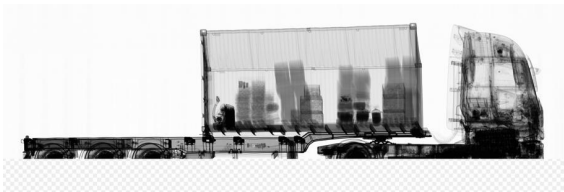
High Energy Image = Wall Removal

High Energy Image = Wall Remova + Depth
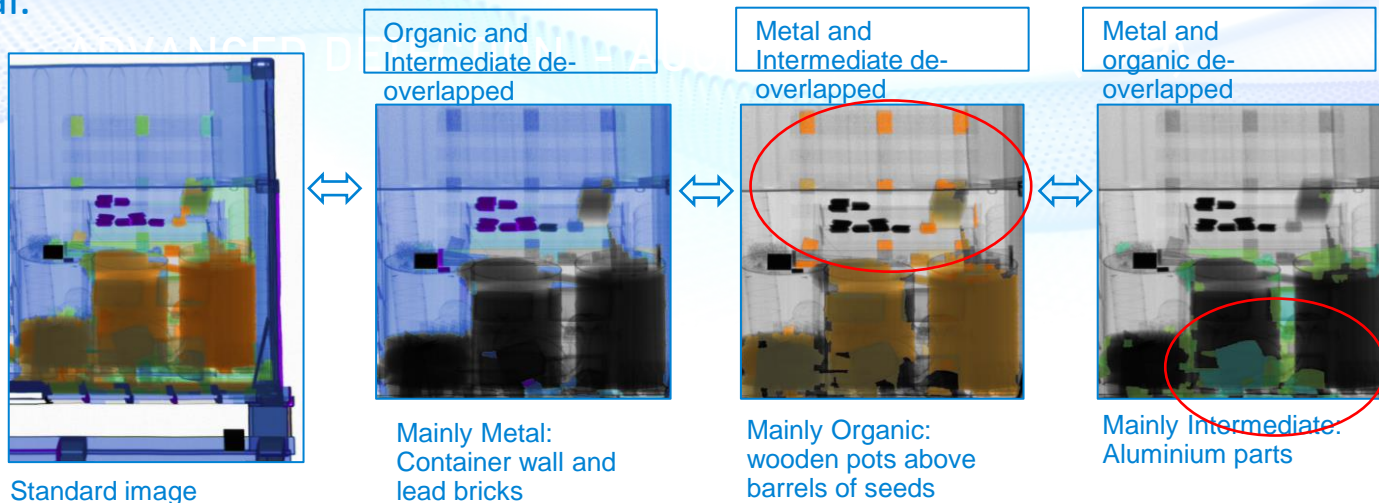
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Material Suppression Tools

3. DE-OVERLAPPING - SEPARATES OBJECTS

Identify overlapping objects of different materials (and therefore areas with potential anomalies) on the X-ray image. By 'de-overlapping' or removing material, it can re-calculate the hidden substance, discriminate more accurately and display more relevant information on the material.

Standard image

Organic and Intermediate de-overlapped

Mainly Metal: Container wall and lead bricks

Metal and Intermediate de-overlapped

Mainly Organic: wooden pots above barrels of seeds

Metal and organic de-overlapped

Mainly Intermediate: Aluminium parts

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Advanced Detection / Summary and Conclusions
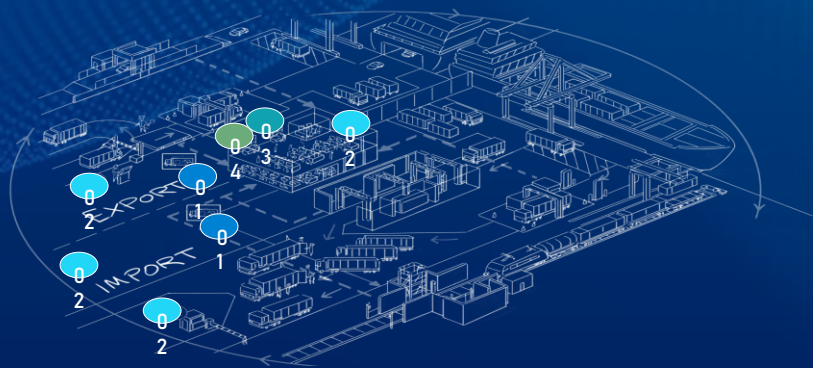
01: ADVANCED DETECTION

02: CONNECTIVITY & INTEGRATION

03: OPERATIONAL MANAGEMENT

04: DATA & ANALYTICS

Industry needs to and will keep driving innovation through a mix of::

I.   Classical Physics and Image manipulation / treatment algorithms

II.   Design, Development, Adoption and Improvement of AI /ML Algorithms to support NII and increase probability of Detection

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Thank You – Questions ?

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