

Utilizing X-ray Portals to Maximize Detection and Throughput at Ports and Borders

WTO Technology Innovation Forum
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Overview

- **Challenges of Customs Screening**
- **Commercially Available X-ray Screening and Inspection Tools**
- **High-Throughput Portal Systems Available Today**
- **Case Studies of Effective Interdiction**

Challenges of Customs Screening

Various Points of Entry

- Land borders
- Airports
- Sea ports

Broad Array of Contraband

- Drugs
- Security threats (explosives, weapons, etc.)
- Stow-aways (people)
- Tax evasion (import duties and tariffs on tobacco products, alcohol, automobiles, etc.)
- Smuggling (art, treasures, money)

Broad Array of Conveyances

- Containers
- Cars
- Trucks

X-ray Screening and Inspection Tools

Mobile Systems



Gantry Systems



Drive-Through Portals



Transmission X-ray



Backscatter X-ray

Combined Systems: Transmission & 3-sided Backscatter X-ray

Combined Gantry Systems



Combined Drive-Through Portals



Trade-offs

- **Mobile Systems**

- Good flexibility – can move system to screening site
- Typically good imaging performance
- Penetration through steel = 320mm (12.6 inches)
 - Wire resolution = 0.8mm (0.03 inch)
- Low throughput – Approximately 25 trucks per hour
- High maintenance cost – vehicle



- **Gantry Systems**

- Highest imaging performance
 - Penetration through steel – up to 400mm (16 inches)
 - Wire resolution – as small as 0.8mm (0.03 inch)
- Slowest throughput – typically about 20 trucks per hour
- Highest first cost – Usually requires a building



Portal Systems (Drive-through)

- **Transmission X-ray Portal**

- Good imaging performance
 - Penetration – 300mm (12 inches)
 - Wire resolution – 3mm (0.12 inches)
- High throughput – 200 trucks per hour
- Low first and maintenance cost



- **Backscatter X-ray Portal**

- Lower penetration
- Multi-sided views
- Organic materials easily identified
- High throughput – 250 trucks per hour
- Low cost of ownership



What's Best for Your Customs Applications?

Three important questions:

1. What's the mission?

- What are you looking to find? (drugs, weapons, stolen goods, humans, money, etc.)
- What is the conveyance? (Vehicle, Container, Pallet, etc.)
- Is a comprehensive inspection required or is rapid screening sufficient?
- Is the contraband likely to be physically small or large?

2. What's the Location?

- Ports, borders, airports?
- Is high-throughput required?

3. What are the ConOps?

- How many operators are required?
- How much space is available?
- Would you ever want to move it?
- What other information is important? – (manifest, license plate, container ID, etc.)

Where Maximum Detection and Throughput Is Important

Transmission, Backscatter or combined X-ray portal systems may be a good solution



Border Crossings



Air Cargo



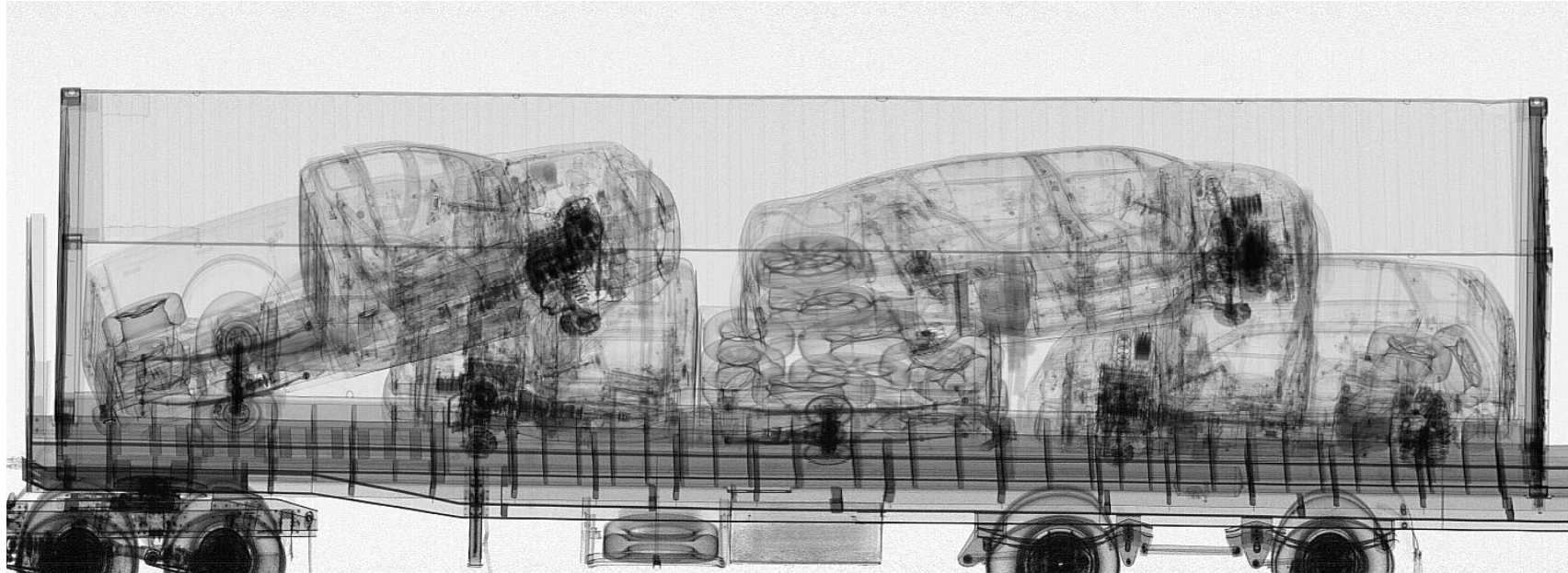
Sea Cargo

Transmission X-ray Portal Cargo System

- Penetrates 300 mm of steel
- 200 Trucks per hour
- Dual-Energy Material Discrimination
- Radiation Safe
 - Cab exclusion option turns on X-rays after the cab and driver have passed the beam. Extremely low scattered radiation dose to driver.
 - Cab Scan option uses low dose X-rays to scan the cab, then increases dose for container only.
 - Safe dose to driver in either case:
 - $<0.05 \mu\text{Sv}$ per scan
 - Below ANSI N43.17 dose limit

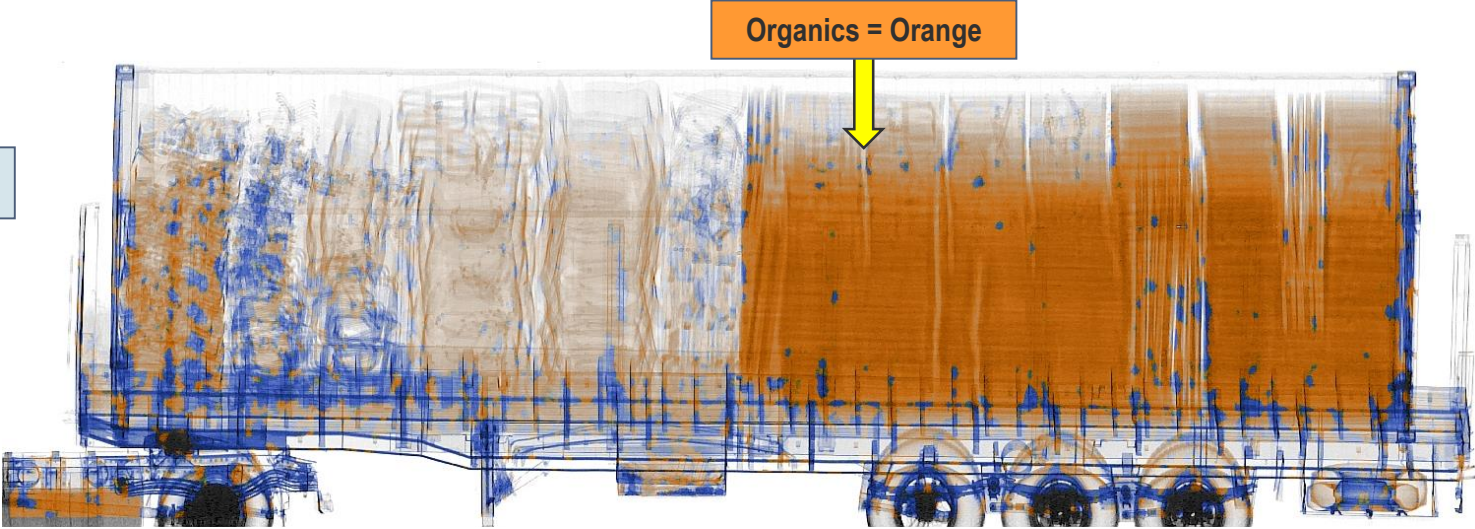


High Energy Transmission X-ray Image

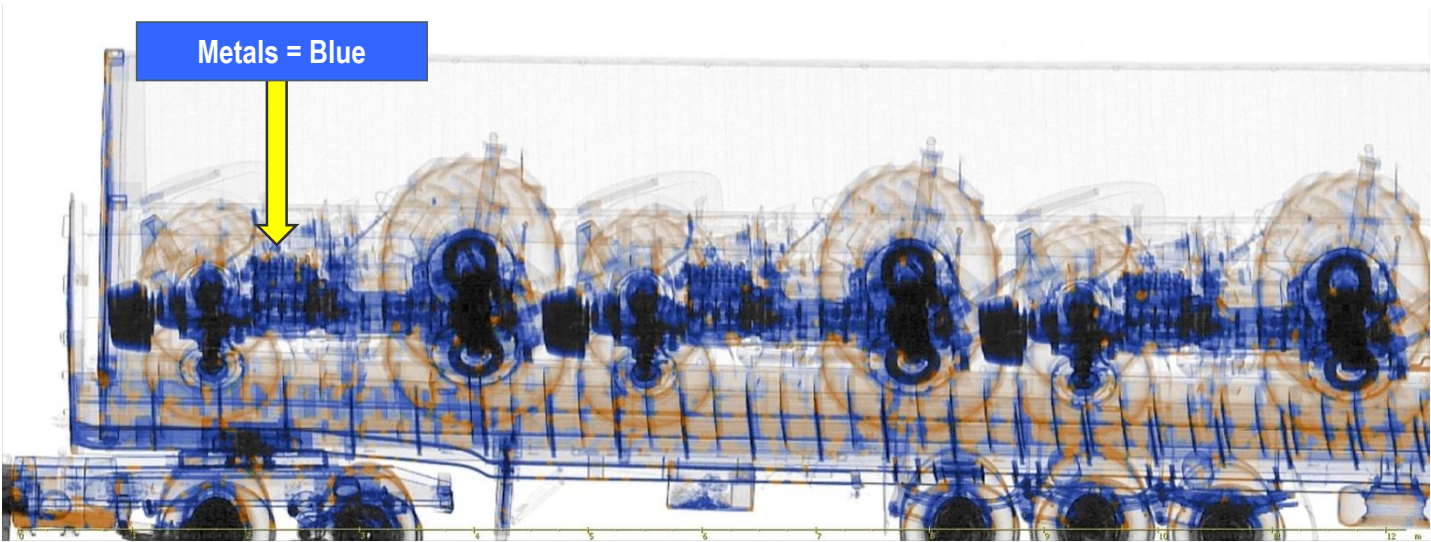


Dual-Energy Transmission Images (Material Discrimination)

Mixed cargo



Farm Tractors



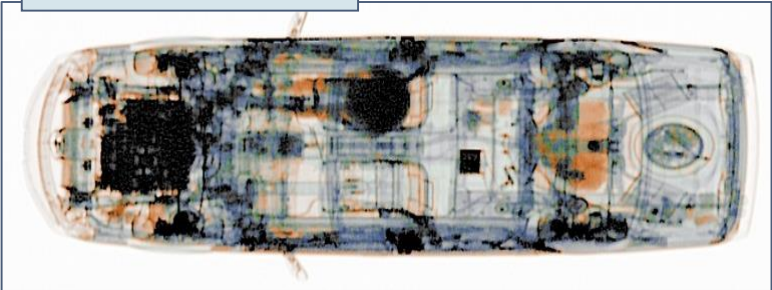
Backscatter X-ray Portal

- Highlights organic materials (drugs, explosives, etc.)
- 400 cars or 250 trucks per hour throughput
- Fits within a standard vehicle toll booth lane
- Top, Left and Right side Backscatter Imaging
- Optional top-down Transmission Imaging with Dual-Energy Material Discrimination
- Radiation Safe for passengers, cargo, operators and the environment
 - $<0.05 \mu\text{Sv}$ per scan
 - Below ANSI N43.17 dose limit



Sample Backscatter Car Portal Image Set

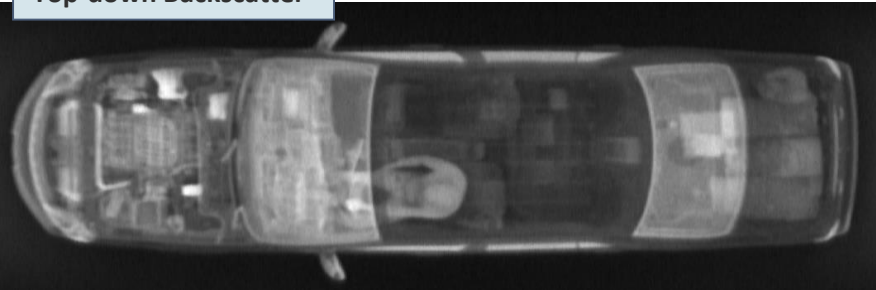
Top-down Transmission



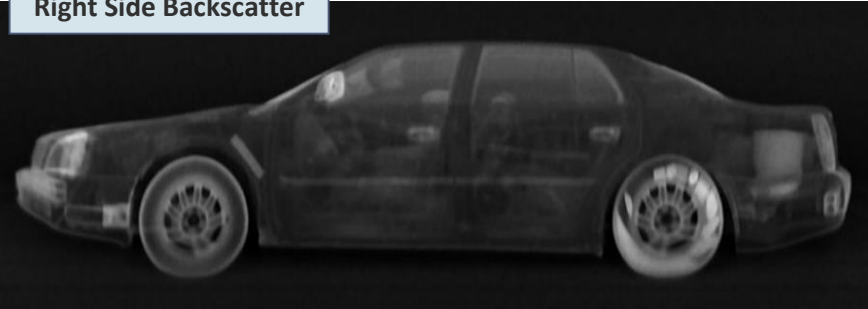
Left Side Backscatter



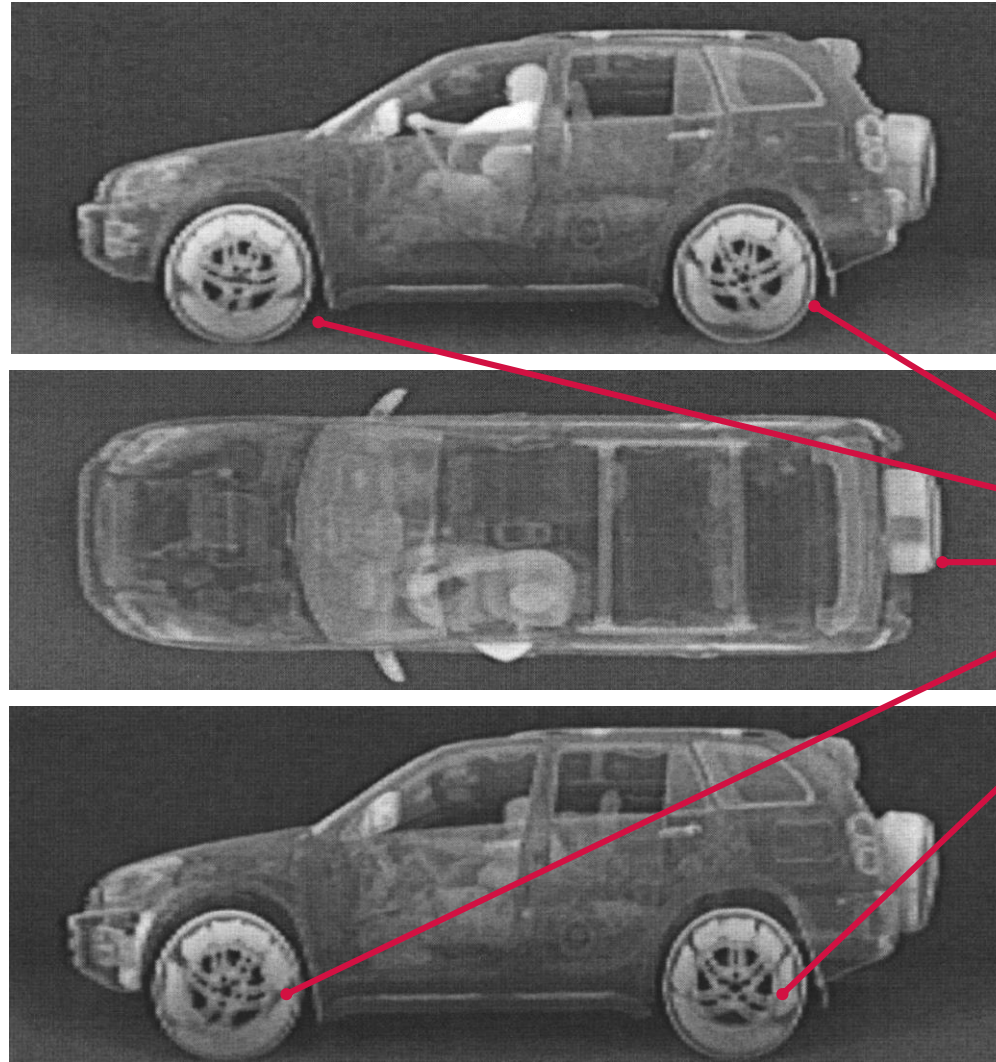
Top-down Backscatter



Right Side Backscatter

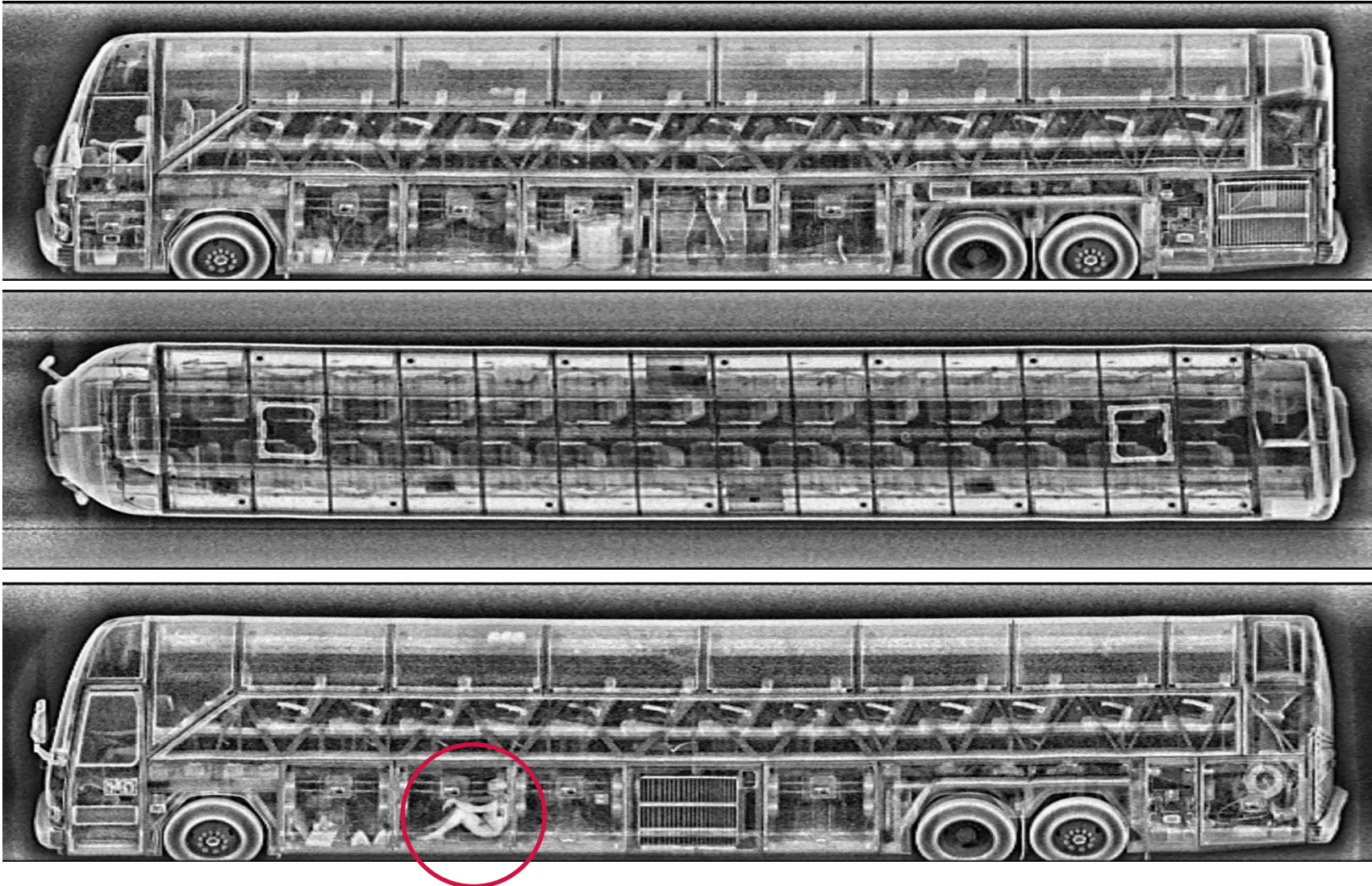


44 Kilos of Cocaine in 5 tires

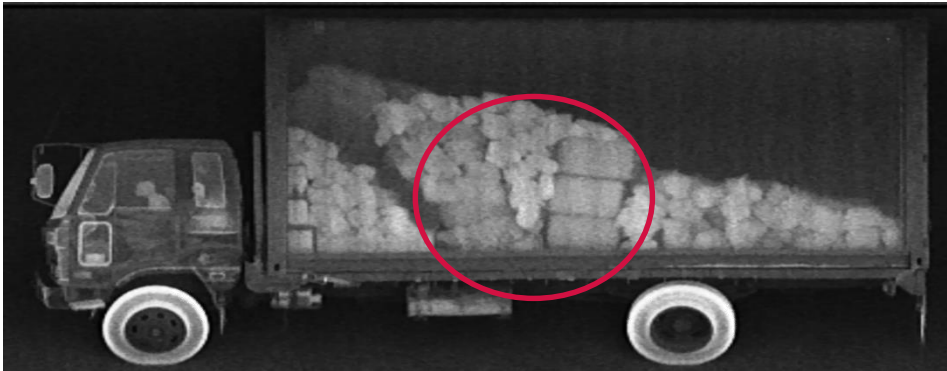
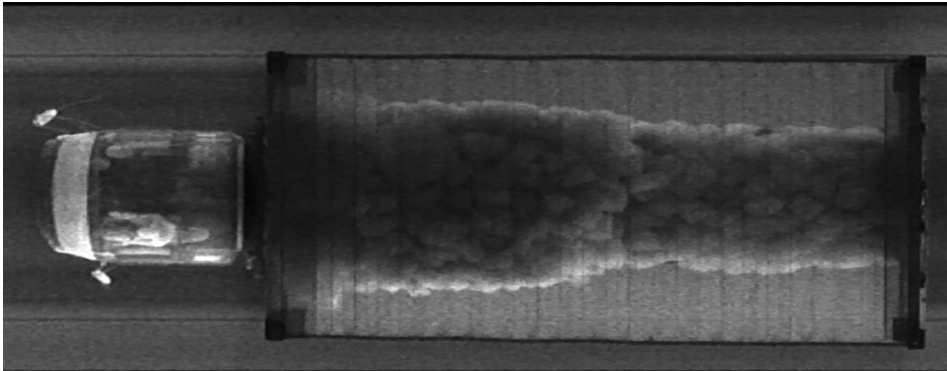
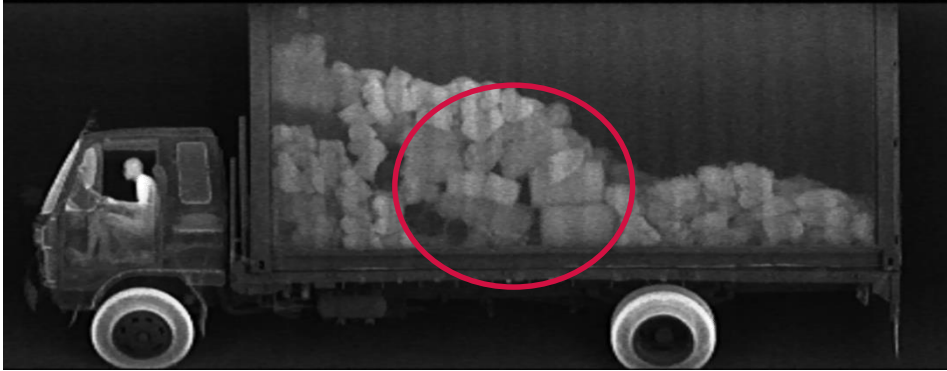


**44 Kilos of Cocaine
in all 5 tires**

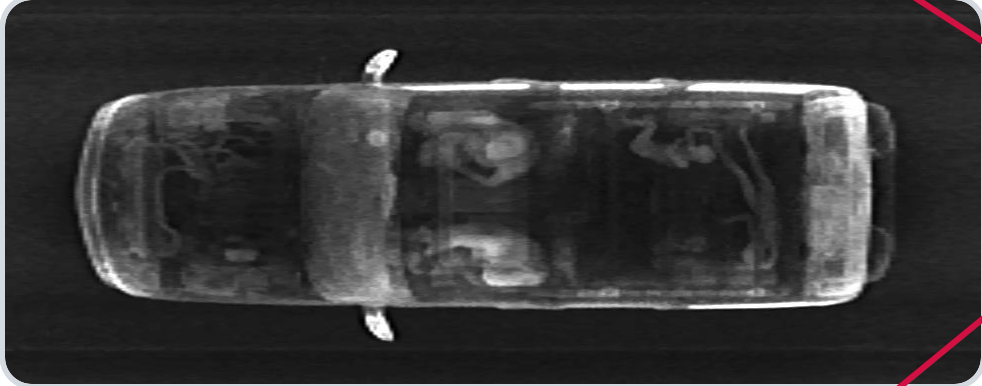
Truck Portal - Bus



Contraband in Cargo



Currency Seizure



Currency
inside door
panels

30 lbs. Methamphetamine in False Truck Bed

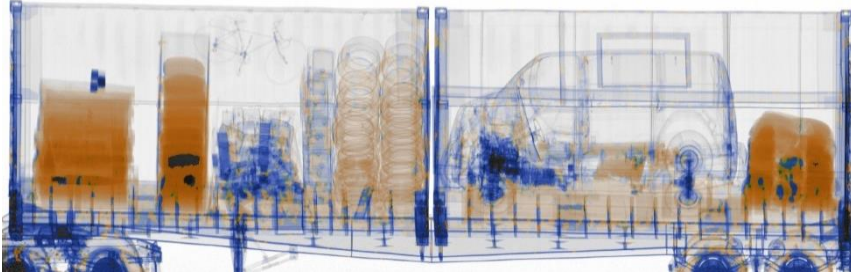


Combined Transmission and Backscatter X-ray Portal

- All features, benefits, and images of both Transmission and Backscatter portals
- Co-located in series for seamless operation
- 200 trucks per hour
- Drive through up to 12 kph
- Can be operated to exclude cab from X-rays
- Can be used for screening air cargo
- Radiation safe for passengers, cargo, operators, and the environment



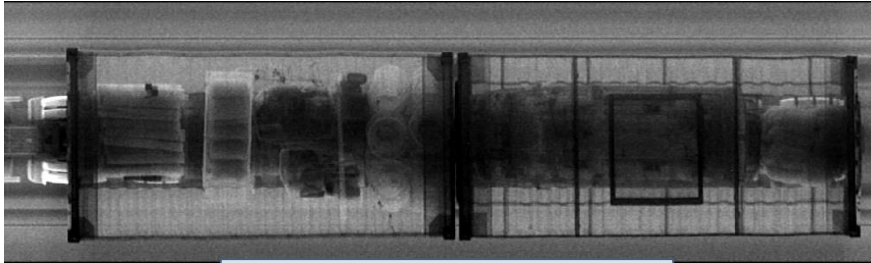
Images from a Combined Portal System



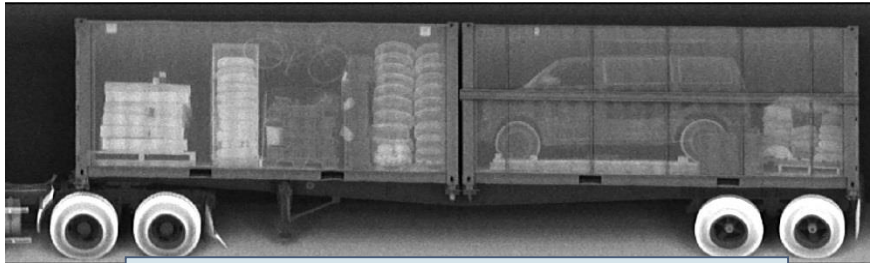
Dual-energy Transmission X-ray



Left side Backscatter



Top down Backscatter



Right side Backscatter

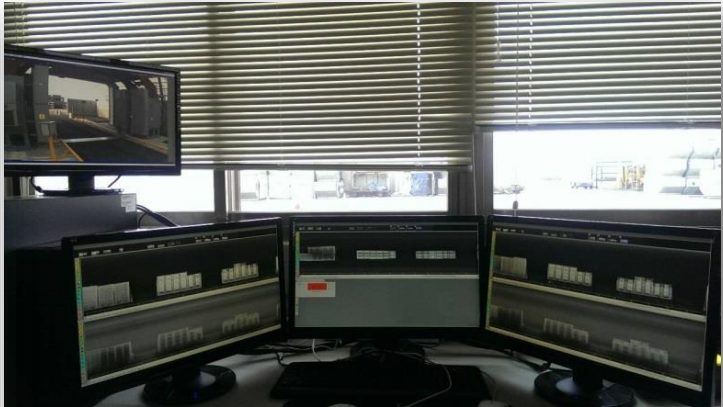
Air Cargo Application of Combined Portals



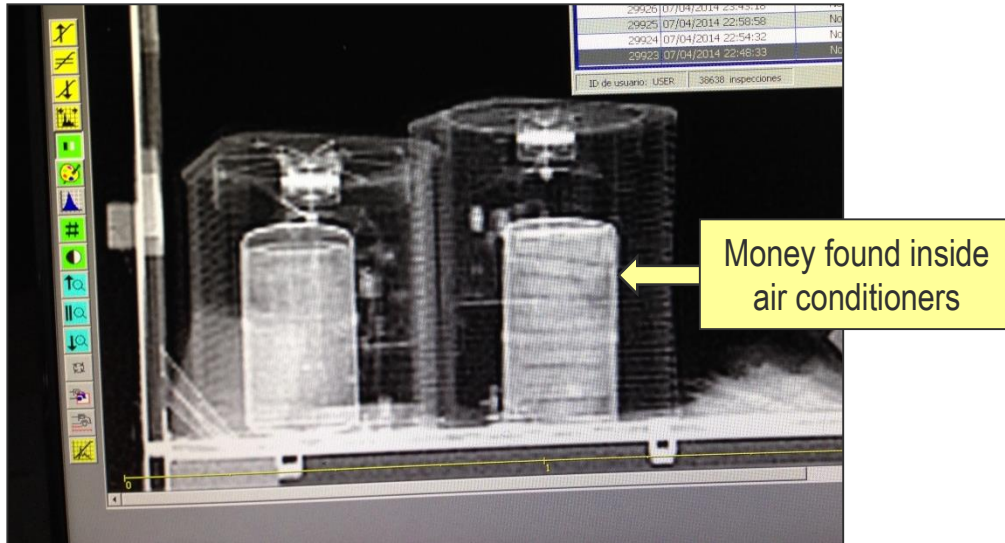
Taiwan International Airport



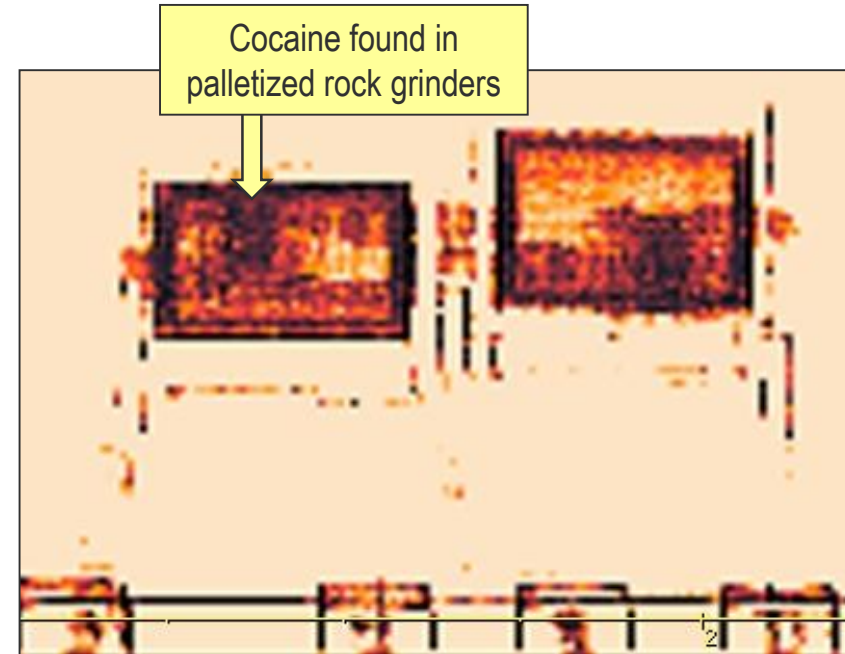
Mexico City International Airport



Examples of Air Cargo Seizures



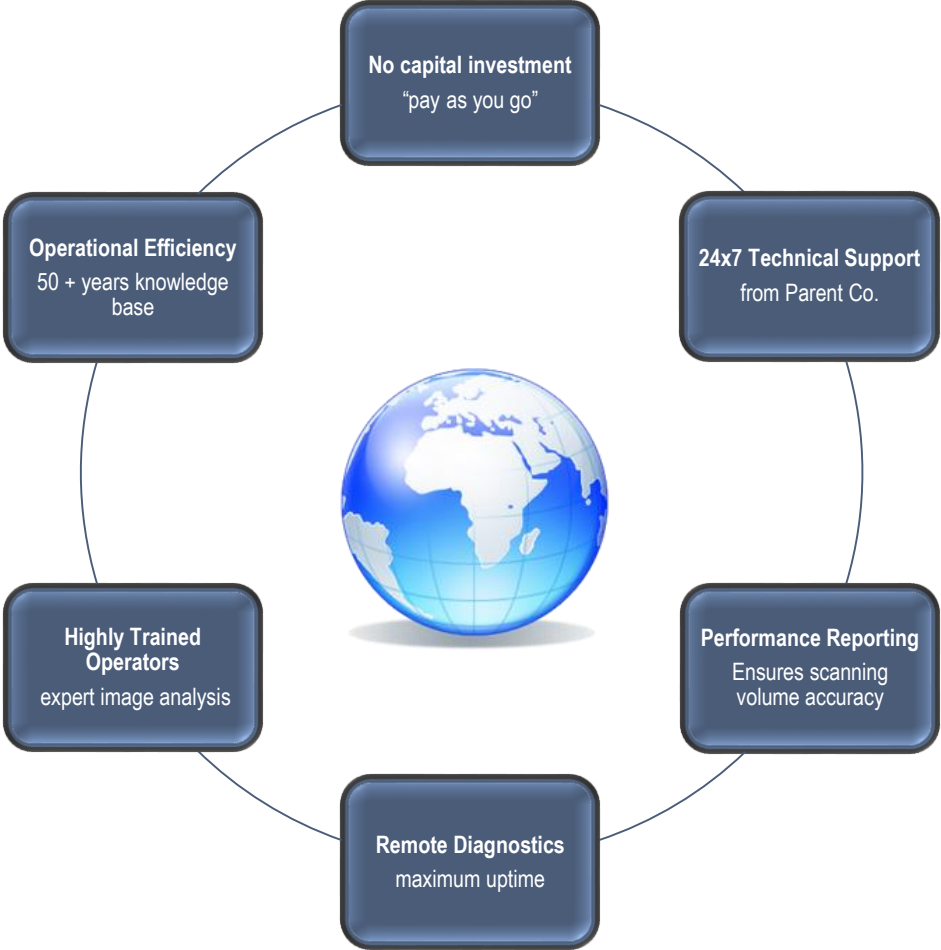
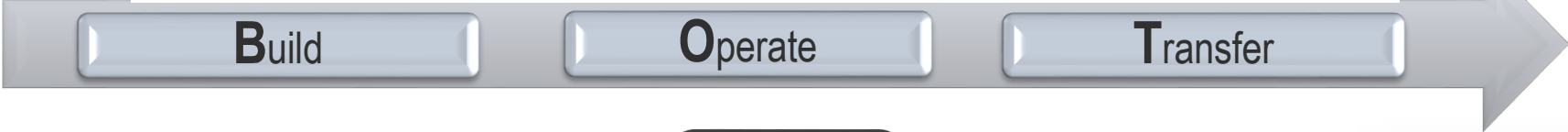
Backscatter X-ray Imaging



Transmission X-ray Imaging

Managed Services

Global Scanning Solutions – BOT Model



Passenger Vehicle Border Crossing Concept

- Drive-through Backscatter portals are embedded into multiple lanes of traffic
- Automated gates control traffic flow
- Vehicle is scanned and license plate is read and recorded
- Data file is networked to Central Analysis Station
- Analysis is performed while driver goes through Customs/Passport control
- Disposition determined and noted in file
- Vehicle proceeds to second gate, license plate read
- If file corresponding to license plate is “clear to go”, light blinks **GREEN** and vehicle returns to traffic flow
- If file indicates otherwise, light blinks **RED** and vehicle is directed to secondary inspection
- Officer types license plate number into wireless tablet to retrieve data file with suspicious region noted
- X-ray image can be used to aid secondary search

Summary

- **Transmission and Backscatter X-ray screening portals fit into standard operations**
- **High throughput and maximum detection with multiple technologies available**
 - High-energy Transmission X-rays
 - Dual-energy material discrimination
 - 3-sided Backscatter X-ray imaging
 - Top-down view in both Transmission and Backscatter
- **Proven technologies**
- **Ideal for border crossings, sea ports, and airports**
- **Radiation safe for passengers, cargo, operators, and the environment**
- **Can be networked**
- **Available as part of a Managed Services BOT**