ICAO - WCO Joint Conference Kuala Lumpur 2016

Developed :

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Ensuring international border security standards Synergy 4 Tech



X-RAY TEST & EVALUATION

Distributed and Manufactured:

The Worlds Most Comprehensive Test Equipment for Medium to Large Sized Scanners: <u>XTE</u>



XTE 1





Easy to use software for image analysis

Patented in Australia, Singapore Pending Patent in Europe, USA & China

- Developed by ANSTO
 (Australian Nuclear Science and Technology Organization),
- Only commercially available non- invasive system to provide comprehensive range of 9 tests, consistent with the ASTM standards,
- Evaluates performance of X-Ray scanners within minutes,
- Easy to use software and reporting,
- Environmentally friendly completely no waste emission.



6 Years In Development & Endorsed by Major Government Border Authorities

Developed by *The Australian Nuclear Science and Technology Organisation* (ANSTO) in collaboration with:



Endorsed by:

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Australia

Under <u>WCO</u> Guidelines and according to the <u>ASTM</u> Standards:





USA



Types of X-Ray, Gamma Ray Scanners

Medium-Sized: Tunnel Size > 1m x 1m; 140keV to 450keV; Use for Air Cargo







Small-Size Scanners: Tunnel Size < 1m x 1m; Use mainly in Airports or Border Crossings Checkpoints























Excerpt from DHS Report for XTE

DHS/ST/TSL-13/133

Test and Evaluation Report for the Assessment of the Australian Image Quality Test Objects for Palletized Cargo X-ray Systems

As part of the qualification process, X-ray machines are required to meet minimum image quality criteria. TSA currently uses a device built to the American National Standards Institute (ANSI) N42.46-2008 standard, as well as the American Society for Testing and Materials (ASTM), International's F792-08 X-ray Test Object for measuring conformance to these criteria. However, ASTM does not recognize the use of the latter test object for assessing systems with tunnel apertures larger than 1 meter x 1 meter [1].

The Australian Nuclear Science and Technology Organisation (ANSTO), with funding from the Australian Government, developed two test objects that can "effectively evaluate the performance of most [X-ray] scanners (from 140 kilovolt [kV] and above) within minutes" [2].



Potential Threats Waiting To Happen if Scanners are Not Maintained Properly



Air India 182 Explosion



Metro Jet Flight 9268 Disaster



Singapore Airlines Flight SQ 1 from SFO

Contraband...



229kg Heroin 2013, Taiwan

4.8 tonnes of cigrattes from Lebanon into Australia, 2009



Bomb Threats.



Explosives loaded on Kingfisher Flight KF4731 , Bangalore

Wildlife Protection...

Animals smuggled through Bankok Subarnabhumi Airport, 2011

1000 elephant task

2013

seized in Hong Kong,











HOW IS XTE USED? – Maritime & Land Ports



XTE

Maritime Ports & Customs

- Large Size X-Ray / Gamma Scanners (1MeV to 9MeV)
- Dimensions
 - L 1.10m, B 1.10m, H 0.95m
- Estimated Weight (XTE 1 & XTE 2 combined)
 - ~ 500kg

HOW IS XTE USED? - Air Cargo Sector







Air Cargo Sector

- Medium Size X-Ray Scanners (140keV to 450keV)
- XTE Dimension (Two Models)
 - L- 1.10m, B 1.10m, H 0.95m
 - L -1.10m, B 0.95m, H 0.95m
- Estimated Weight (XTE 1 & XTE 2 Combined) ~ 250kg to 350kg

XTE

PROCESS OF TEST IN PALLET CARGO ENVIRONMENT RESULTS OF TEST (Evaluation Reports / Audits) Start QC test - Electronic template Enter Results from Paper Template Perform Single Tes Incomplete Folde **Medium Size Pallet** Set Up/Edit Profiles View Results **X-Ray Scanners** Software Scoring & Evaluation by Certified Personal **Captured Test Image**

XTE Loaded on Scanner by Forklift



Common Problems (Penetration)

XTE 1



• Main Causes: Failure in maintenance and inadequate testing.

Common Problems (Material Discrimination)



- Material Differentiation not working properly
 - PASSED

Material Differentiation still works Software assigns colours correctly

• Main Causes: Failure in maintenance and inadequate testing.

XTE Border Protection Users

Australia Custom and Border Protection Services



Australian Government Australian Customs and Border Protection Service

Australia



USA



US Naval Base

US CBP

U.S. Customs and Border Protection



Thailand



Advertised on Korean Newspaper

Awaiting

DEMO

АОТ



ICA

Singapore Customs

Singapore



Republic of Korea



BENEFITS OF USING XTE

- Prevent revenue loss. Eg: Terrorism.
- Operational Efficiency Eg. Long-term economic benefits from reduced dwelling time to increased revenue for customs collections (i.e, customs revenue collection and goods tax collections).
- Asset Protection Audit record for service and performance of equipment.
- Compliance with WCO Guidelines
- Branding of Customer's ports or airports Example: Safest Ports in Asean/Europe/Americas

Excerpt from WCO Guidelines for Procurement of Scanners

In establishing performance standards for NII scanners used by the Australian Customs and Border Protection Service, advice was sought from other Australian government agencies including the Australian Nuclear Science and Technology Organisation; the Department of Infrastructure and Transport; and the Defence Science and Technology Organisation. Advice was also sought from independent scientific advisers contracted by the Customs and Border Protection Service, and from other Customs administrations.

1.2.3 Fees/charges on using scanners

The Australian Customs and Border Protection Service purchases NII scanners under a capital funding process, which sets out the installment payments be made at the time of contract signing, delivery/installation and acceptance testing. A separate maintenance contract is in place with each x-ray supplier that covers preventative maintenance and fault response. The cost of maintenance is generally about 10% per annum of the capital cost of the machine.

XTE to be use for: 1. acquisitions, 2. pre and post scheduled maintenance from OEMs and 3. Periodic (bimonthly/monthly) maintenance for yearly audits of equipment.







谢谢 Terima Kasih Dank U Gracias

Merci

ขอบคุณค่ะ ขอบคุณครับ

Danke 너를 감사하십시요

Σας ευχαριστούμε

спасибо

Grazie

Obrigado

ありがとう



Setting the standard for international border security



X-RAY TEST & EVALUATION

Nine Tests

As described in the Internationally recognised ASTM F792-01-e2 standard







TEST 1: RESOLUTION TEST

To determine and quantify the basic image resolution capability of the scanner source. This is a very basic test of any imaging system. Clarity through number of data pixels and the (IQI) are determined by the systems ability to image thin copper wires in air and behind steel concealment of various thickness.

TEST 2 and 3: MATERIAL DISCRIMINATION in AIR

To determine organic (explosive and contraband surrogates) thickness with special attention to material discrimination and limits of detection of the organic materials.

TEST 4: CONTRAST SENSITIVITY (CS)

To determine CS or capability of the system to detect objects through steel concealment. Essentially it is a quantitative measure of system's ability to penetrate and see thinnest objects. CS% = thickness of steel plate / thickness of blocking plates *100. And the smaller the CS% number the better contrast sensitivity.

TEST 5: MATERIALS DISCRIMINATION (MD) behind CONCEALMENT

To determine the system's capability discriminate between materials and determine presence of contraband and explosives behind steel concealment. This is a hard test and will reveal the true capability of the MD claims by the makers of the scanner.

TEST 6: SPATIAL RESOLUTION

Spatial Resolution in low density matrix to evaluate the scanner capability of determining small objects in closely packed cargo. This test incorporates resolution and scan speed and the system ability to resolve small spatially separated objects.

TEST 7: MATERIAL DISCRIMINATION

To determine the systems ability to colour code the objects present in the cargo and to conform to accepted colour coding conventions. The test requires to produce colour variations according to average composition (atomic) and not vary according to object thickness. All known contrabands falls within this Zeff range.

TEST 8: SPATIAL RESOLUTION behind CONCEALMENT

Spatial Resolution through Steel Wedge to determine if the system is capable of resolving closely spaced objects behind concealment. Same as Test 6, but behind concealment.

TEST 9: PENETRATION THROUGH STEEL

To determine the penetration performance of the source. This is also the very basic function of the imaging system.

Comparison Of Global Non-Intrusive Image Testing Standards

Standard	Publication date	< 1m wide tunnel	> Or equal 1m tunnel	Material Discrimination	Contrast Sensitivity
XTE	First used 2006, patent 2008**	Yes, 950mm base version	Yes, 1100mm base version	Yes	Yes
ANSI N42.46	<mark>2008</mark>	No	Yes	No	No
ASTM-F792	2001	Yes	No	Too small to use on medium & large scanners	Too small to use on medium & large scanners

** Patented Commercially Worldwide, including: US, EU, Australia, Singapore, China.