

GESEC R&D - IMAGING TECHNOLOGY FOR SECURITY APPLICATIONS

SPEED – IMAGE QUALITY – INTERNAL THREAT IDENTIFICATION - SAFETY

Full body scanner for airport screening is a several billion \$ potential market. Current full-body scanners introduced at airports are based on reflection of high frequency radio-electric waves (MMW) or on backscattered X-rays to visualize objects hidden on the surface of a subject. X-ray use is possible due to a low-dose necessary to get the full-body scanned. However, current scan takes minutes and is limited to the surface, i.e. is unable to detect objects below the surface of the subject. **GESEC R&D** developed a technique based on transmitted X-rays, allowing to make an image of objects located inside a subject with a dose similar to the one used with backscattered X-rays and during the time (1 s) that a person takes to go through a gate. Advanced Imaging Technology of **GESEC R&D** allows **speed** (only 1s), **internal threat identification**, **safe** and cost effective **full deployment**.

The New York Times

U.S. Adds Body Bombs to Concerns on Air Travel

By BRIAN KNOWLTON and NICOLA CLARK
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WASHINGTON — Air security is expected to tighten, particularly for international flights into the United States, in light of recent intelligence that terrorists might be considering boarding flights with surgically implanted explosive devices, an American security official said Wednesday.

Los Angeles Times

TSA warns of possible airline threat involving implanted bombs

July 06, 2011 | By Christi Parsons

The government has warned airlines that terrorists are considering surgically implanting explosives into people in an attempt to circumvent screening procedures, according to U.S. officials.

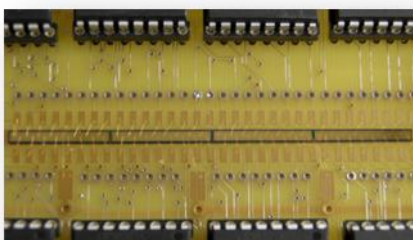
There is no indication of an immediate plot, but the new information could lead to additional screening procedures at the nation's airports. Existing scanners would not necessarily detect bombs implanted under a person's skin, experts said.



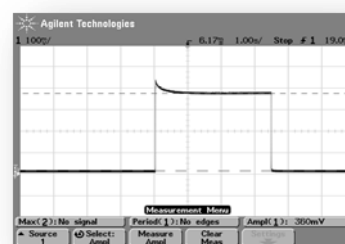
A gate, using the transmission of X-rays through a subject, allows detecting **drugs, weapons** or **explosives** (organic or inorganic) carried inside or outside this subject. Such a gate becomes possible for person inspection when the dose received by the subject is negligible.

GESEC R&D, which converts directly X-rays photons into electrons, is sensitive to the instantaneous flux of X rays. Since it is characterized by a fast response, it acquires the signal in a short time (in the μs range), thus allowing to reduce considerably the dose (flux multiplied by time of exposure) necessary to make an image.

For a subject moving at 3.6 km/h (1 m/s), with a barrette of detectors taking 1 image/ms under typical radiography conditions (1 mSv/s delivered in 1 s), the dose received by the subject in 1 ms is 1 μSv . This dose is below "the negligible individual dose" (1 mSv/an), which corresponds to 2.7 $\mu\text{Sv/day}$. It is also lower than the natural dose (6 $\mu\text{Sv/day}$), or the dose received during a Paris-New York flight (20 μSv).



Barrette of 64, 1 mm², pixels detectors



Time dependence of the detector response (1 s/div)

The images shown below, untreated, are obtained with an X-ray flux of 1 mSv/s and an acquisition time on a pixel (1 mm²) of 60 μs .

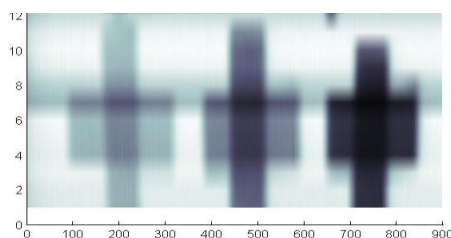


Image of Nickel foils (32,64,192 μm thick from left to right) at 30 kV, 30 mA

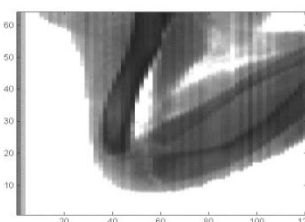


Image of a chicken wing at 60 kV, 10 mA, an acquisition time on a pixel (1 mm²) of 60 μs .