General security X-ray scanning systems

The innovative solution of a novel real time X-ray inspection concept is to use multiple energy (spectral) data acquisition in a very specific manner, so that an image is created which includes information on the specific materials represented in the inspected luggage, with automatic identification of threat items.

This technology is cost-effective for **general security tasks**, e.g for applications relative to big audiences, exhibitions, cruises, hotels, etc. The big advantage is the ability to provide the assessment of threats posed by liquids, gels and chemical compounds, in addition to the general X-ray image of the (bag) contents.

The concept uses multi-energy imaging detectors in combination with intelligent pre-screening, á priori information, and large databases which allows the fitting of the actual X-ray attenuation "profile" to a matching set of material combinations. **The approach is specifically relevant for general security applications where the time of the inspection is a critical parameter**. The inspection is based on an automatic recognition of threat compounds and therefore will speed up the human decision taking meaning less time per scanned "person". In addition, the ability of determining a threat substance with a high probability gives much more value.

Specifications:
The system has an integrated climate control system and can be used even in very warm climates. It integrates a long conveyor section, and the system is very rigid, built for remote deployment. Short start up time and easy close down procedure adds to the benefits.
The key benefit is the ability to identify threat liquids based on one single projection. The system is available for general security screening, based on human image interpretation, aided by the system threat identification. The system will inspect general bags up to 40 x 40 cm in cross section, and will provide alarm to the operator if for any reason the inspection of the bag is problematic (due to content, threats, or otherwise). Inspection speed is 20 m/min. Typical throughput up to 0.5 person (bag) per second.

Figures:

1. Low and intermediate energy images of a bag with items and filled bottles with water and alcohol. Data analysis based on the energy response of the different liquids enables a real-time assessment of the basic constituents, and facilitates the detection e.g. of threat liquids and gels.
2. Data extracted from images of bottles, showing the discrimination between water and alcohol, compared to the actual difference in X-ray attenuation. This shows, that the X-ray attenuation data extracted from the images can be used to discriminate between different liquids, gels, and other chemical compounds, and hence be used for the detection of e.g. security threats .