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Information

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Weiterführende Informationen zu den Technologien im Projekt C-BORD (auf Englisch)

For **X-ray imaging**, in C-BORD Smiths Detection has developed a new detector technology to reduce image distortions in mobile mode, caused by road irregularity, creating detection system oscillations while the cargo is scanned. A new representation for material discrimination has also been investigated to improve material discrimination through identifying objects in cargo by de-overlapping them from the background and surroundings. Both techniques tested in the laboratory have led to improved image quality for medium-energy X-ray scanners.

For **passive radiation detectors**, the innovations developed by Symetrica Ltd and the French Alternative Energies and Atomic Energy Commission (CEA) improve material identification to reduce nuisance alarms from Naturally Occurring Radioactive Materials (NORMs), such as ceramics or fertilizer, and the localisation of radioactive sources within the container. Fixed and mobile devices have been developed as well as detectors fully integrated in a mobile X-ray scanner. When combined with cargo manifest data and overlaid on the x-ray image, preliminary results have shown that the probability of threat detection can be further increased.

The **Evaporation Based Detection** system samples the air in a cargo container to detect Volatile Organic Compounds and trace particles whose patterns are indicative of targeted substances such as drugs or explosives. Through machine learning, the system can be trained to be sensitive to additional substances of interest to Customs, which is faced with evolving threats, for example, from new synthetic drugs. Similar systems exist today for small volumes, such as luggage inspection, but no system has yet been able to handle the large volume of a cargo container with high levels of diverse background chemical signatures. This is the challenge for C-BORD partners University of Manchester, ESIEE, CEA and Hochschule Bonn-Rhein-Sieg (H-BRS), University of Applied Sciences.

The **photo-fission technique** has not been tested in a European port scenario ever before. This technique uses the same linear accelerator as high energy (9 MeV) X-ray scanners, and by counting the slight differences in time of flight of emitted particles, Special Nuclear Materials (SNM) are detectable, even when hidden behind dense materials. SNM, which can be used to create a nuclear weapon, is of particular interest for national security.

In the **Tagged Neutron Inspection System**, neutrons emitted by a neutron generator can penetrate materials and produce reactions that provide information on the elemental composition of the cargo – the ratio of carbon, nitrogen, and oxygen in the case of explosives. Algorithms have been developed to interpret the data and comparison with

reference tables allows the classification of material. The C-BORD prototype, with integrated shielding, is designed to reduce the restricted area around it. Explosives, drugs, and cigarettes are the main targets.

Both photo-fission and tagged neutron inspection techniques investigate a specific area within the container identified in the x-ray scan as ambiguous and thus are designed to work in combination with X-ray as second-line inspection devices.

Smiths Detection has designed a **common user interface**, based on the X-ray image, in which the results of inspection from the various devices can be viewed by the customs analyst. The analyst can review results of first line inspections, direct the positioning of second line inspections, and make an informed decision based on the combined data. Standardisation of data formats to allow interoperability and data sharing is also an area in which C-BORD lays the groundwork for the future exploitation by Customs.