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#08-35 Passive isotope specific gamma ray tomography of a nuclear waste drum using a CeBr3 Compton camera

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In various situations such as legacy wastes or optimising waste storage and decontamination costs, it would be very helpful to know the 3D distribution of various contaminants inside an object prior to decision making. Compton camera with their wide field of view could allow such tomography in a cost effective way, but so far their spatial resolution and sensitivity was too limited for precision 3D imaging.

We have been imaging a 220 l nuclear waste drum at ANDRA using a temporal imaging CeBr3 camera. Three views of the drum defining an orthogonal trihedral in the referential of the drum center were acquired using a mechanical fixture in order to insure precise relative position and orientation between the views. The drum contained a total activity of 14 MBq with 3 main isotopes detected in the Compton spectrum: 60Co, 110Ag and 137Cs. Each of the 3 acquisitions lasted 20 minutes. As the object imaged is relatively small and low density, one view seems sufficient for each trihedral axis.

An image reconstruction algorithm has been developed based on cone intersection in 3D space. The image was then treated using LM/MLEM to increase contrast. We then create images of activity distribution for each of the isotopes detected. For this drum, we had also a 2D X-ray image showing structures inside the object. We have thus cut our 3D gamma images in planar slices each 2 cm and project them as a movie with the x-ray image as a background in order to understand the organisation of contamination inside the drum.

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