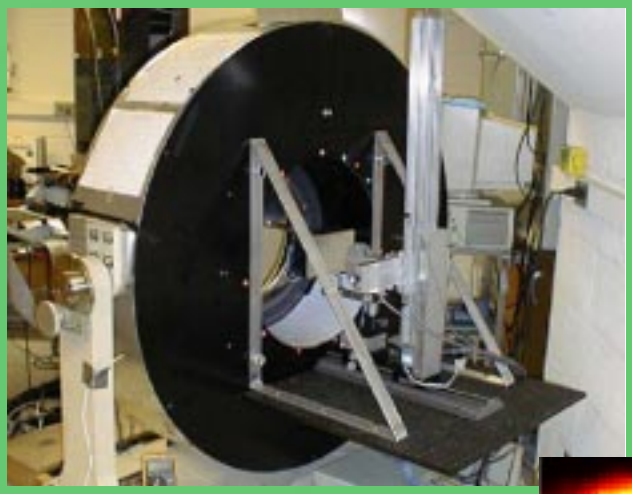
The Compton Camera

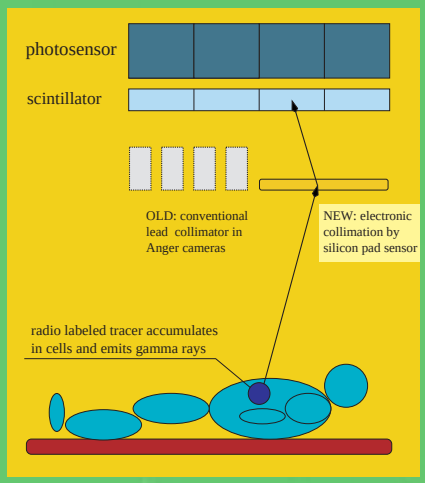
medical imaging with Higher sensitivity

The Compton Camera reconstructs the origin of Compton-scattered X-rays using electronic collimation with Silicon pad detectors instead of the heavy conventional lead collimators in Anger cameras - reaching up to 200 times better sensitivity and a factor two improvement in resolution. Possible applications are in cancer diagnosis, neurology neurobiology, and cardiology.



Imaging simple objects with the 'Compton Sprint' setup at the Medical School of the University of Michigan. The Silicon double metal pad sensor and the very low noise readout electronics developed at CERN are located in the centre of a ring of sodium iodide (NaI) scintillators.

A reconstructed image of a Z-shaped object (four by five centimetres)

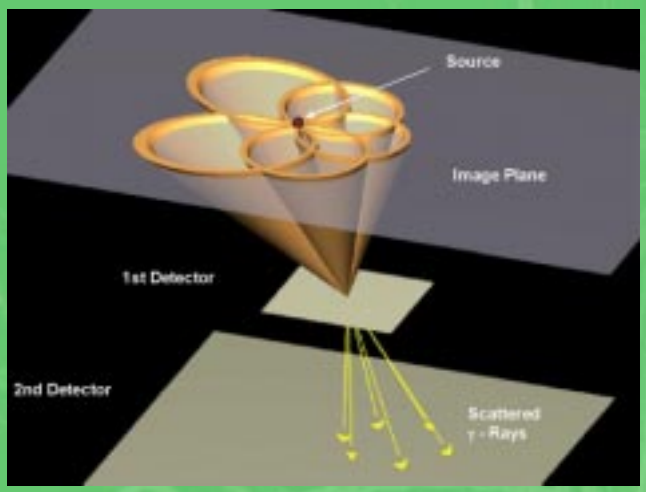


The principle of the Anger camera using lead collimators (left), and of the Compton camera using silicon pad sensors (right)

PROJECTS FOR APPLICATIONS OF THE COMPTON CAMERA (CERN - University of Michigan):

High resolution small animal PET scanning

Prostate probe for Single Photon Emission Computed Tomography (SPECT)



The concept of Compton image reconstruction is illustrated here. A gamma ray emitted by the tracer material (source) scatters in detector one (middle) and is captured in detector two (bottom). The energy lost in detector one and two can be used to determine the angle that the gamma ray scattered after it interacted in detector one. The positions of the interactions in detectors one and two determines the direction of the scattered gamma ray. Its origin is localized to a conical structure around this direction. By projecting the cone back, and by the superposition of many such rings, the complete image can be reconstructed.

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