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Design and Performance Tests of a Calorimetric Tract of Compton Camera for Small-Animals Imaging

Imaging based on gamma-rays emitted from radio-isotopes has recently become an important tool for measuring the bio-distribution of radiotracers in small animals. Detectors based on the Compton concept allow higher gamma-ray efficiency compared to conventional gamma cameras, and feature sub millimeter spatial resolution and compact geometry.
We are developing a Compton Camera, designed to image small animals administered with radiotracers such as 99mTc and 188Re. This camera has to address some requirements: relatively high activities of the imaged objects; relatively low gamma-ray energy of the sources (140keV –160keV); presence of gamma and beta radiation with energies up to 2MeV in case of 188Re. The camera consists of a thin position-sensitive "tracker"that scatters the gamma ray, and a second position-sensitive detection system to absorb completely the energy of the scattered photons ("calorimeter").
We present the results about the design and realization of the calorimetric tract and discuss the choice of scintillator crystal, pixel size, and detector geometry. Simulations including gamma-ray tracking from source to detector have been performed. Crystals of different materials such as NaI, LaBr3 and GSO and thicknesses, in continuous or segmented geometry, have been optically coupled to a multi-anode detector Hamamatsu H8500, allowing measurements of spatial resolution and efficiency. Simulations and measurements show satisfactory results.

Summary (Additional text describing your work. Can be pasted here or give an URL to a PDF document):

http://www.pd.infn.it/~rossi/VCI2010_CC_DETAILS.pdf

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