



Contribution ID: 96

Type: **Poster presentation**

First steps towards small prototype gamma camera based on wavelength shifting fibers

Tuesday, 5 July 2011 12:47 (1 minute)

We are studying and developing a gamma camera based on optical fibers coupled to both sides of inorganic scintillation crystals and using for the light readout highly sensitive photodetectors, namely silicon photomultipliers (SiPMs) and high efficiency multi-anode photomultiplier tubes (MaPMTs). The coupling of the fibers in orthogonal directions allows obtaining 2D position information, while the energy signal is provided by a PMT. The application of optical fibers combined with SiPMs as light sensors is likely to improve the spatial resolution to the 1-2 mm FWHM level, thus improving the sensitivity of scintigraphy techniques.

A first prototype laboratory system has been developed using a custom-made $50 \times 50 \times 3$ mm³ CsI(Na) crystal with embedded 1 mm \varnothing fibers and reading out the light from 12 of the fibers in each direction with a MaPMT. Proof-of-concept studies and results obtained with this system using Co-57 are presented. Larger prototype systems up to 12×12 cm² are planned, using 1 mm² SiPMs individually coupled to the fibers. Ongoing development and preliminary results of these prototypes will be presented.

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Session Classification: Poster Mini Talks V

Track Classification: Applications