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(G*) Electron detectors for the MOLLER Experiment

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High Voltage Monolithic Active Pixel Sensors (HVMAPS) are a new type of electron detector. This hybrid pixel detector combines the semiconductor sensor elements that detect high energy particles with the readout electronics in one element. The demand for fast, high resolution and low noise detectors by experiments conducted at the LHC initiated the development of hybrid pixel detectors, first being developed at CERN in the 1980s [1]. Each pixel has its own integrated readout electronics. The manufacturing process provides high levels of customization like radiation thickness and radiation length, thereby allowing the control of material budget for detectors, where scattering could be an issue. HVMAPS have been used as detectors for the Mu3e experiment [2]. As thin as 50 microns, the latest version of the HVMAPS, (MuPix Version 11) are the ideal electron detector for applications in the MOLLER experiment at Jefferson Lab [3], The experiment proposes to measure the asymmetry of parity violating scattering, APV, in polarized electron-electron scattering, thereby measuring the Weinberg angle to a greater precision. This presentation outlines the use of HVMAPS in two aspects of the experiment: the Compton polarimeter, and the main detectors, for tracking the path and position of electrons respectively.

[1] Philip Garrou, C Bower, and P Ramm. Introduction to 3d integration. In Handbook of 3D Integration Vol 1-Technology and Applications of 3D Integrated Circuits. Wiley-VCH, 2008.

[2] Niklaus Berger, Mu3e Collaboration, et al. The mu3e experiment. Nuclear Physics B-Proceedings Supplements, 248:35–40, 2014.

[3] Mammei, Juliette. "The MOLLER experiment." arXiv preprint arXiv:1208.1260 (2012).

Keyword-1

Electron Detector

Keyword-2

MOLLER

Keyword-3

HVMAPS

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