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SiPM optical modeling and optical crosstalk simulation for ARGO

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ARGO is a future dark matter direct-detection experiment based on a liquid argon (LAr) target that is proposed to be built at SNOLAB in the next decade. ARGO will produce leading sensitivity to heavy dark matter searches above 50 GeV/c2. It will also have excellent sensitivity to detect core-collapse supernova neutrinos and produce high-precision measurements of solar neutrinos at and above the 7Be shoulder. For photodetection in ARGO, we are interested in pixelated silicon photomultiplier (SiPM) photosensors with fast photon timing that will allow good position reconstruction and novel hit-pattern-based event discrimination. However, the optical crosstalk (oCT) noise associated with SiPMs can affect the electronic recoil/nuclear recoil pulse-shape discrimination and distort spatial/temporal photon hit patterns, limiting background rejection. We have developed a full Monte Carlo simulation of a pixelated SiPM system including oCT to evaluate the detector performance and to determine constraints on SiPMs to reach that performance. In my talk, I will describe our MC model and present some results about the impact of oCT on the detector energy threshold and the event position reconstruction.

Keyword-1

Dark Matter

Keyword-2

ARGO

Keyword-3

Silicon PhotoMultiplier

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