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Potential of Digital SiPM for light detection in Xenon based applications

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Digital SiPMs are a technology were single-photon avalanche diodes (SPADs) and their CMOS readout electronics are on the same chip. This approach reduces system complexity, which improves radio purity, and allowing the readout to be tailored to the experiment. The SPAD quality improved in recent years to the point where their performance in terms of dark count rate, quantum efficiency and crosstalk are comparable to traditional analog SiPMs. However, issues such as the lack of sensitivity for very short wavelength UV light still need to be solved. We discuss the opportunities and challenges associated with Digital SiPMs operated as light detector in Xenon and present a chip with an architecture designed for rare event search with liquid Xenon. The chip offers a very high fill factor of over 70%, high position resolution and the possibility of light imaging. The digital readout of the chip can process both short intense bursts of photons as well as a weak constant fluxes. A simple serial data protocol reduces the number of pads and thus cables and multiple chips can be daisy chained to form compact and dens detector modules that are controlled with less than ten cables.

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