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Using Photo-converting Dopants to Improve Large LArTPC Performance

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A challenge in large LArTPCs is efficient photon collection for low energy, MeV-scale, deposits. Past studies have demonstrated that augmenting traditional ionization-based calorimetry with information from the scintillation signals can greatly improve the precision of measurements of energy deposited. We propose the use of photo-converting dopants to efficiently convert the scintillation signals of the liquid argon directly into ionization signals. This could enable the collection of more than 40% of all the scintillation signal, a considerable improvement over conventional light collection solutions. We will discuss the implications this can have on LArTPC physics programs, what hints of performance improvements we can gather from past studies, and what R&D we envision are needed to establish using these dopants in large LArTPCs.

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