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Distributed Imaging for Liquid Scintillation Detectors

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Abstract: We discuss a novel paradigm in the optical readout of scintillation radiation detectors. In one common configuration, such detectors are homogeneous and the scintillation light is collected and recorded by external photodetectors. It is usually assumed that imaging in such a photon-starved and large-emittance regime is not possible. Here we show that the appropriate optics, matched with highly segmented photodetector coverage and dedicated reconstruction software, can be used to produce images of the radiation-induced events. In particular, such a 'distributed imaging' system can discriminate between events produced as a single cluster and those resulting from more delocalized energy depositions. This is crucial in discriminating many common backgrounds at MeV energies. With the use of simulation, we demonstrate the performance of a detector augmented with a practical, if preliminary, set of optics. Finally, we remark that this new technique lends itself to be adapted to different detector sizes and briefly discuss the implications for a number of common applications in science and technology.

Session

Lightning Round (5+3 min)

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