

Quantum dot based scintillators for charged particle detection

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Advances in semiconductor research and development have enabled engineering of scintillation materials based on quantum dot (QD) photoluminescence. This has yielded low-mass and radiation tolerant scintillators with excellent timing and light-yield performance awaiting application in high energy physics experiments. We introduce a detector system of such a scintillator that consists of bulk GaAs with embedded sheets of self-assembled InAs QDs combined with physically integrated photodiodes for light collection. Early research and development of ~ 20 micron thin prototype sensors detecting 5.5 MeV α -particles have shown fast decay constants of ~ 500 ps with ~ 70 ps time resolution and a light collection of 3.0×10^4 electrons / MeV using simple electronics readout. We describe results of recent measurements, discuss ongoing improvements in the detector and readout design, and present plans for performance testing to assess applications to high energy charged particle detection.

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