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Advances in radiation detectors based on finely-segmented PSD plastic scintillator: from fast neutrons to reactor antineutrinos[1] VIACHESLAV LI, Lawrence Livermore Natl Lab, SANDD/ROADSTR COLLABORATION — Pulse-shape discrimination between nuclear and electronic recoil is a powerful technique to improve background rejection of scintillation detectors. Until recently, only liquid form of PSD organic scintillators was in use. The invention of stable plastic PSD scintillators at Lawrence Livermore National Laboratory made it possible to envision a new class of radiation detectors. The plastic form is advantageous over liquid as one can machine segments of the scintillator into any desired size and shape. At LLNL, we have been designing and testing a variety of finely-segmented detectors, utilizing silicon photomultiplier arrays (SiPMs) as well as conventional photomultiplier tubes. The scintillation photons propagate along the segments to the photosensors via total internal reflection. Such detectors can be used in a variety of applications and basic research. If doped with ^{6}Li, the scintillator becomes sensitive to thermal neutrons; thus, capable of detecting reactor antineutrinos via the inverse-beta-decay (IBD) reaction. This has been the primary focus of our research to develop the Segmented AntiNeutrino Directional Detector (SANDD); and it is the main subject of this talk.

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