

Bernard Kippelen
Georgia Tech

Title: Innovations in the detection of nuclear materials: novel plastic scintillators and organic photodiodes

Abstract:

Photomultiplier tubes and other Silicon-based optoelectronic technology platforms coupled with plastic scintillators based on fluorescent emitters are the foundation of the detection of nuclear materials. Innovations in scintillators and detectors are required to make these systems more operationally deployable. In this talk, we will discuss recent advances in both areas of research. In the area of scintillators, we will discuss recent advances in making novel scintillators from mechanically robust materials containing light-emitting molecules with thermally activated delayed fluorescence (TADF) and high-Z compounds loaded in photopolymerizable resins that could lead to mass-production at low-cost into scintillators of various shapes of interest using rapidly adaptable manufacturing techniques such as 3D printing. In the second part of the talk, we will present a detailed characterization of the electronic noise of organic photodiodes (OPDs) based on polymeric bulk heterojunctions. By comparing their performance side-by-side with that of the best-in-class Si photodiodes (SiPDs) (Hamamatsu S-1133), we show that they rival low-noise SiPDs in all metrics, within the visible spectral range, except response time.