Materials science and applied systems with organic scintillator radiation detectors

Abstract: Organic scintillator materials are employed as radiation detectors in many areas including nuclear security, nonproliferation, safeguards, and basic science research. These materials are particularly useful because of their ability to detect neutrons and gamma-rays simultaneously and discriminate between them. This particle type dependence results from energy transfer mechanisms that lead to or inhibit light emission, many of which are poorly understood. An improved understanding of these physical mechanisms could allow users to improve their detection technique or inform the development of new materials with superior properties.

In this talk, Dr. Schuster will introduce a number of detector systems that employ organic scintillator materials for identifying, characterizing, and imaging radiation and radioactive sources. These include two of her latest projects: studying fission physics with the LANL LANSCE Chi-Nu array and designing a zero-knowledge nuclear warhead verification system with a coded aperture imager.

Next, Dr. Schuster will present her experimental characterizations of the scintillation dependence on radiation particle type, interaction direction, and temperature. She will dig into the light production mechanisms and share her working hypothesis on why these three effects exist. She will conclude by exploring what her findings mean for new materials development and what further studies can be done through measurement and simulation.

Biography: Dr. Patricia Schuster is a University of Michigan President’s Postdoctoral Fellow in the Nuclear Engineering and Radiological Sciences department. She completed her PhD at the University of California, Berkeley in 2016, where she studied radiation detection materials and instrumentation for a broad range of nuclear security applications. Dr. Schuster’s dissertation research was performed at Sandia National Laboratories in Livermore, CA through the Nuclear Science and Security Consortium. Dr. Schuster also studies nuclear security policy, including work on cross domain deterrence as implemented historically by US policy makers. In her free time, she enjoys trying new restaurants, taking her dog on hikes, and running with friends.

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