From eV to MeV: Laser- and Accelerator-based Detection of Nuclear Materials

Abstract: Detection of shielded special nuclear material, especially in transit, is arguably the grand challenge for nuclear security. Another long-standing problem has been the rapid detection of both radioactive and non-radioactive materials associated with proliferation activities, both at short and long standoff distances. Fundamental limitations present in such measurements may be addressed by active interrogation that uses penetrating, time-structured, and directional radiation probes. I will first review our research activities pertaining to detection of shielded special nuclear material using MeV-class monoenergetic photons produced in low-energy nuclear reactions. Next, I will discuss how eV-range optical photons from ultrafast lasers can be employed for standoff measurements, focusing on our recent progress in isotopically sensitive detection of elemental uranium and uranium compounds by atomic and molecular spectroscopy.

Biography: Igor Jovanovic received his B.S./M.S. in Electrical Engineering from the University of Zagreb, Croatia in 1997 and his Ph.D. in Nuclear Engineering from the University of California, Berkeley in 2001. He was a staff physicist at Lawrence Livermore National Laboratory in the period of 2002-2007, after which he served as a faculty member at Purdue and Penn State University. Since 2016 he has been a Professor of Nuclear Engineering and Radiological Sciences and Professor of Applied Physics at the University of Michigan. His group conducts research in the area of applied nuclear science, with primary focus on nuclear security, nonproliferation, nuclear forensics, and ultrafast optics. His work has been funded by DARPA, ONR, DTRA, DOE, NSF, DHS, NRC, and industry. Dr. Jovanovic is a recipient of the DARPA Young Faculty Award and the DHS Nuclear Forensics Junior Faculty Award. He serves as the Director of Michigan’s Neutron Science Laboratory, leader of the Applied Nuclear Science Group, and is associated with the High-Field Science Group in the Center for Ultrafast Optical Science.

Tuesday, 9/11/2018
12:00 PM, ERB 106