GEN IV International Forum

Expertise | Collaboration | Excellence

Webinar Invite

Education and Training Working Group

Join us on July 27, 2022, 8:30 am EDT (UTC-4)

A Gas Cherenkov Muon Spectrometer for Nuclear Security Applications

Cosmic ray muons have been considered as a non-conventional radiation probe for imaging large and dense objects because they are high-energetic and penetrative. To maximize the utilizable of cosmic ray muons in engineering applications, two important quantities, trajectory and momentum, must be known. The muon trajectories are easily reconstructed using two-fold detector arrays with a high spatial resolution. However, precise measurement of muon momentum is difficult to achieve without deploying large and expensive spectrometers. In our research, we developed a novel muon spectrometer using multi-layer pressurized gas Cherenkov radiators and demonstrate its functionality for muon momentum measurement using high fidelity Gen IV simulations. In addition, we developed a new imaging algorithm for muon tomography, or mPoCA, by integrating muon momentum information into the original PoCA algorithm. The results of reconstructed images of various materials using both PoCA and mPoCA algorithms will be presented and compared. Not only is the image resolution significantly improved but also we were able to visually differentiate shielding material (Pb) from special nuclear materials otherwise impossible to see with the original PoCA.

Free webcast!

July 27, 2022
8:30 am EDT (UTC-4)

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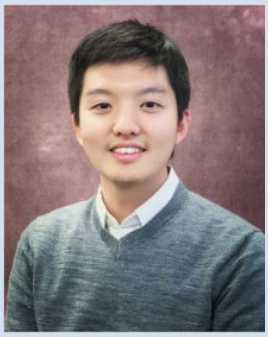
Who should attend:
policymakers, managers, regulators, students, general public



Dr. Junghyun Bae recently completed his Ph.D. at the School of Nuclear Engineering at Purdue University. He will join the Used Fuel and Nuclear Material Disposition group of the Nuclear Energy and Fuel Cycle Division at the Oak Ridge National Laboratory as a Eugene P. Wigner Distinguished Staff Fellow. His research focuses on the development of a high-resolution fieldable muon spectrometer using multi-layer pressurized gas Cherenkov radiators and its applications, i.e., muon tomography, nuclear security, Spent Nuclear Fuel (SNF) casks imaging. He earned his M.S degree in nuclear engineering from the University of California, Berkeley, and his B.S. degree in Nuclear and Quantum Engineering from the Korea Advanced Institute of Science and Technology (KAIST). Dr. Bae won the 'Pitch Your PhD' competition during the 2021 ANS Winter Meeting and Technology Expo in Washington, D.C. He has also been nominated and awarded the Roy G. Post Foundation scholarship, ANS, and KSEA graduate scholarships for his contribution to the safe management of nuclear materials.

Upcoming Webinars

31 August 2022, China's Multi-purpose SMR-ACP100 Design and Project Progress, Dr. Song Danrong, Nuclear Power Institute of China

28 September 2022 Development of In-Service Inspection Rules for Sodium-Cooled Fast Reactors Using the System Based Code Concept, Dr. Takaya, JAEA, Japan

26 October 2022, Sodium Integral Effect Test Loop for Safety Simulation and Assessment (STELLA), Dr. Jewhan Lee, KAERI, ROK

28 November 2022, Visualization Tool for Comparing Energy Generation Options, Professor Mark Deinert, Colorado School of Mines, USA

For more information, please contact Patricia Paviet at patricia.paviet@pnnl.gov or visit the GIF website at www.gen-4.org

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