“ Illuminating the Dark Sector at Neutrino Experiments ”

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Abstract

While the Standard Model of particle physics has been wildly successful at describing particle physics in most laboratory settings, it fails to describe the universe as observed in cosmology. Among the puzzles in connecting models of particle physics with cosmology is determining the nature of dark matter. Resolving this puzzle requires new searches for non-gravitational interactions of dark matter in laboratory experiments. Dedicated strategies for looking for specific dark matter candidates have not yet yielded a confirmed discovery, so there has been an explosion of new search strategies to ensure all possibilities are covered. I will discuss several candidate models for dark matter and related particles of a broader dark sector, with a particular emphasis on the role that neutrino experiments can play in this program. The models I focus on include dark sector portals, boosted dark matter, and mesogenesis. I will present aspects of these models from their motivation is cosmology through to the development of searches at the ICARUS and DUNE experiments. I will demonstrate that neutrino experiments play a vital role in future searches for dark matter and dark sectors and will ensure coverage of all possible avenues at our disposal to the discovery of physics beyond the Standard Model of particle physics.

Biography

Professor Berger received his B.Sc. from McGill University in 2006 and his Ph.D. from Cornell University in 2012. Following his Ph.D., he held postdoctoral research positions at SLAC National Accelerator Laboratory and University of Wisconsin-Madison. He was then the Samuel P. Langley Pitt PACC fellow at University of Pittsburgh. He joined the Department of Physics at Colorado State University in 2020. Since coming to CSU, he has received awards from the National Science Foundation and the Department of Energy. In addition to his work in the theory and phenomenology of particle physics, he has been a member of the ICARUS and DUNE experimental collaborations since 2020. His work has studied a wide range of questions in particle physics, with a particular focus on the study of new models of dark matter and particle cosmology over the last decade.