

Title: Ab initio atomic and nuclear theory for fundamental symmetries studies

Abstract: Long considered a phenomenological field, breakthroughs in our understanding of the many-body problem and nuclear and electroweak forces in nuclei are rapidly transforming modern nuclear theory into a true first-principles, or ab initio, discipline. In particular this allows us to address some of the most exciting questions in physics beyond the standard model such as the nature of dark matter and neutrino masses, as well as searches for violations of fundamental symmetries in nature.

In this talk I will briefly outline our many-body approach, the valence-space in-medium similarity renormalization group and how recent progress now allows us to calculate properties of virtually all open-shell nuclei to the heaviest regions, as well as first extensions to open-shell atomic systems. I will focus on ground-state energies, charge radii, and electromagnetic moments when confronted with the latest measurements from laser spectroscopy experiments. Overall this approach now paves the way to provide ab initio calculations of nuclear and atomic properties needed for systems relevant for ongoing and future searches for fundamental symmetry violation.