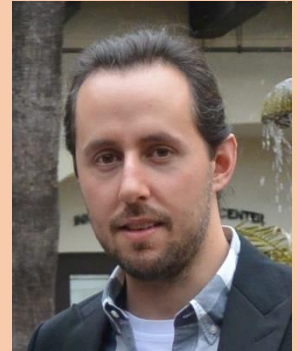


CM / AMO Seminar

← Condensed Matter & Atomic Molecular Optical →

Wednesday, February 14, 2018 → 705 Pupin Hall → 12:15 PM

**Christian Schneider,
University of California, Los Angeles**



"Quantum Control as a Resource for Fundamental Physics and Technology"

Precise control over quantum systems is the foundation of quantum technology that will shape our society in revolutionary ways---from computation and simulation to sensing and communication. Alongside technological advances, better and better quantum control will enable new tests of fundamental physics. I will discuss our efforts on both fundamental physics and technological aspects.

First, I will focus on our work with cold atoms and ions in a hybrid atom--ion setup. An integrated time-of-flight mass spectrometer allows for the analysis of ion ensembles with isotopic resolution. Recent results will be highlighted such as the demonstration of non-equilibrium physics between atoms and ions as well as the discovery of a new class of molecules. Ultimately, this work aims at a quantum computation platform utilizing cold molecular ions.

Second, I will report on our search for the nuclear isomeric transition in thorium-229. This transition around 160nm eludes nuclear physics techniques but becomes accessible to lasers and is a prime candidate for future optical clocks and fundamental physics tests. In a first direct search using thorium-doped crystals and tunable VUV synchrotron light, we were able to exclude a large region of transition frequencies vs. lifetimes. Our ongoing efforts with a home-built VUV laser system will yield significantly improved sensitivity.

Lastly, future directions will be outlined using novel quantum systems with far-reaching impact on metrology, quantum sensing, quantum computation, quantum chemistry, and fundamental physics tests.