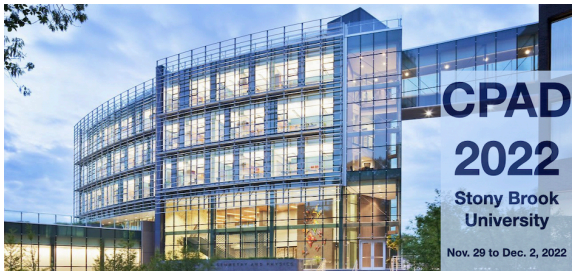

Contribution ID: **134** Type: **Contribution Talk**

Novel Light-Field Imaging Device with Enhanced Light Collection for Cold Atom Clouds

Wednesday, 30 November 2022 08:50 (20 minutes)

Long baseline atom interferometry offers new opportunities to expand the search for ultra-light dark matter, mid-band gravitational waves, and very weakly-coupled fifth forces. In this context, we developed a novel light-field imaging system that captures multiple views of an atom cloud with a single shot while also maximizing light collection. This enables a single-shot, 3D tomographic reconstruction of cold atom clouds, enhancing the physics capabilities of current and future quantum experiments using cold atom clouds. Simulation results demonstrate that this system is capable of single-shot tomography of atom clouds of size O(1mm) with O(100μm) features, reconstructing the 3D distribution of atoms and features not accessible from any single view angle in isolation. We also demonstrate this system with a 3D-printed prototype. The prototype is used to take images of O(1mm) sized objects, and 3D reconstruction algorithms running on a single-shot image successfully reconstruct target features. The prototype also shows that the system can be built with 3D printing technology and hence can be deployed quickly and cost-effectively in experiments with needs for enhanced light collection or 3D reconstruction.

Primary authors: Dr SCHWARTZMAN, Ariel (SLAC National Accelerator Laboratory); Dr FRISCH, Joe (Google (previously SLAC)); CHEONG, Sanha (Stanford / SLAC); Dr KAGAN, Michael (SLAC National Accelerator Laboratory); Dr SAFDARI, Murtaza (Fermilab (previously SLAC)); Dr GASIOROWSKI, Sean (SLAC National Accelerator Laboratory)

Presenter: CHEONG, Sanha (Stanford / SLAC)

Session Classification: WG4: Quantum and Superconducting Detectors

Track Classification: WG4: Quantum and Superconducting Detectors