Lindsay LeBlanc – Colloquium 2/21/2019

Title: Storing and manipulating light for quantum memory and manipulation using Autler-Townes splitting in cold atoms

Abstract:
By maintaining quantum coherences during interactions between light and matter, optically encoded quantum information can be preserved and manipulated in order to perform a number of different critical tasks for quantum communications and computation. While techniques including electromagnetically induced transparency (EIT) have been exploited for this purpose in the past, we recently demonstrated a new means for storing and manipulating light using interactions with a three-level atomic system that is technically less demanding than established methods. Using the Autler-Townes effect to modify the absorption profile of an atomic system, we find that we can store pulses of light, including those with less than one average photon per pulse, and manipulate the coherences in the light, including performing coherent temporal beamsplitting operations. Our new "ATS quantum memory" is especially compatible with broadband optical signals, and opens up a technically accessible paradigm for quantum memory that can be used in any quantum three level system.