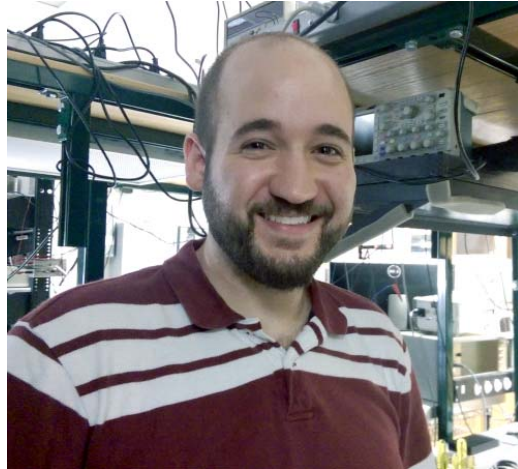


Physics & Engineering Department



Coherent Population Trapping and Optical Ramsey Interference for Compact Rubidium Clock Development



Zachary Warren

PH.D. (OPTICS) DISSERTATION DEFENSE

1:00pm – 2:00pm, Tuesday, December 6th, 2016

OSCAR Building - Seminar Room A103

Coherent population trapping (CPT) and optical Ramsey interference provide new avenues for developing compact, high-performance atomic clocks. In this work, I have studied the fundamental aspects of CPT and Ramsey interference for the Raman clock development, theoretically, as well as experimentally. During my presentation, I will describe a comprehensive atomic model developed to investigate light shift in the Raman clock. I have investigated the possibility of reducing (or suppressing) the light shift associated with Ramsey interference which will allow us to achieve higher frequency stability in the atomic clock. I will discuss a new repeated-query technique that can produce ultra-narrow linewidth Ramsey fringes with high S/N ratio. I will also discuss my efforts to develop a Raman atomic clock prototype using a custom-designed rubidium (^{87}Rb) vapor cell physics package, and show experimental results illustrating its frequency stability performance for practical applications.