Abstract Submitted
for the DAMOP17 Meeting of
The American Physical Society

Dark soliton rings in a Bose–Einstein condensate using Raman imprinting techniques MAITREYI JAYASEELAN, JOSEPH D. MURPHREE, JUSTIN T. SCHULTZ, AZURE HANSEN, NICHOLAS P. BIGELOW, Univ of Rochester — Soliton rings in optical beams have been theoretically and experimentally investigated for their interesting dynamics and connections with novel phenomena, including the formation of non-trivial topological states such as vortices. Density and phase engineering techniques have been proposed to create soliton rings in Bose–Einstein condensates. Here, we explore using a coherent two-photon Raman optical imprinting technique to generate dark soliton rings in a Zeeman spin state of a ^{87}Rb Bose–Einstein condensate (BEC). The relative intensities and phase of the Raman beams determine the relative populations and phase of the atomic spin states, which can then be measured through atom-optic polarimetry. Dark soliton rings correspond to an annular edge dislocation with a phase jump of π, forcing the density to vanish at the dislocation. We use higher-order Laguerre–Gauss p-modes with the requisite singular phase and intensity profiles to create concentric soliton rings in the BEC via the Raman process, creating dark soliton rings in one spin component filled with population from the second component. Resonant depletion allows us to selectively remove one spin state, facilitating evolution studies of both filled and dark soliton rings.

Maitreyi Jayaseelan
Univ of Rochester

Date submitted: 27 Jan 2017