Abstract Submitted
for the DAMOP16 Meeting of
The American Physical Society

Controllable high bandwidth storage of optical information in a Bose-Einstein Condensate MAITREYI JAYASEELAN, JUSTIN T. SCHULTZ, JOSEPH D. MURPHREE, AZURE HANSEN, NICHOLAS P. BIGELOW, University of Rochester — The storage and retrieval of optical information has been of interest for a variety of applications including quantum information processing, quantum networks and quantum memories. Several schemes have been investigated and realized with weak, narrowband pulses, including techniques using EIT in solid state systems and both hot and cold atomic vapors. In contrast, we investigate the storage and manipulation of strong, high bandwidth pulses in a Bose-Einstein Condensate (BEC) of ultracold ^{87}Rb atoms. As a storage medium for optical pulses, BECs offer long storage times and preserve the coherence properties of the input information, suppressing unwanted thermal decoherence effects. We present numerical simulations of nanosecond pulses addressing a three-level lambda system on the D2 line of ^{87}Rb. The signal pulse is stored as a localized spin excitation in the condensate and can be moved or retrieved by reapplication of successive control pulses. The relative Rabi frequencies and areas of the pulses and the local atomic density in the condensate determine the storage location and readout of the signal pulse. Extending this scheme to use beams with a variety of spatial modes such as Hermite- and Laguerre-Gaussian modes offers an expanded alphabet for information storage.

Maitreyi Jayaseelan
University of Rochester

Date submitted: 29 Jan 2016 Electronic form version 1.4