Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

Improved Optical Magnetometer Based on Electromagnetically Induced Transparency in a Ring-Cavity Setup BHASKAR ROY BARDHAN, MOOCHAN KIM, JONATHAN DOWLING, Louisiana State University — We propose and simulate a ring-gyro optical magnetometer based on polarization rotation of an optical field in an electromagnetically induced transparency (EIT) system. By properly choosing the polarization orientations of the optical field and the transition energy levels, the transparency conditions for the polarization components are derived for the EIT system inserted into the ring-cavity setup as a cell. As the optical field passes through the cell, the fluctuations of the Rabi frequency as well as the density inside the cell, due to the fluctuations in the laser field, give rise to the dephasing of the polarization vector. We show that using the setup it is possible to achieve very sensitive measurement of the magnetic field. Besides, by making several round trips of the photons, the dephasing effects can be removed by some suitable dynamical decoupling schemes implemented with additional waveplates in the setup. This enables us to obtain long interrogation length for the EIT based optical magnetometer.

Bhaskar Roy Bardhan
Louisiana State University

Date submitted: 27 Jan 2012 Electronic form version 1.4