Abstract Submitted
for the DAMOP09 Meeting of
The American Physical Society

RF atomic magnetometer with spin squeezing[1] GEORGIOS VASILAKIS, VISHAL SHAH, MICHAEL ROMALIS, Princeton University — Atom projection noise sets a fundamental limit on the sensitivity of atomic magnetometry. Spin squeezing can overcome this limit, but for time scales shorter than the transverse spin relaxation time. In traditional high density alkali atom magnetometers the transverse relaxation time is mainly limited by spin exchange collisions between alkali atoms; however in the limit of high polarization spin exchange collisions do not contribute to the relaxation mechanism (light narrowing effect). We are exploring experimentally the possibility of utilizing spin squeezing in combination with the light narrowing effect to increase the sensitivity of a ^{39}K RF magnetometer. The Faraday rotation of a linearly polarized probe pulsed at twice the Larmor frequency is used as a quantum non demolition probe for the spin squeezing. Preliminary results demonstrate the reduction of the probe back-action on the spin projection. A high power pump laser polarizes the medium to nearly 100%, and is switched off during the data acquisition. A well suited application for this magnetometer is the detection of NQR signals, which last for timescales comparable to the relaxation time.

[1]cbet-0730489

Georgios Vasilakis
Princeton University

Date submitted: 23 Jan 2009 Electronic form version 1.4