Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Progress Towards an Ultracold Trapped Atom Interferometer[1]

SHUANGLI DU, ANDREW ROTUNNO, DOUGLAS BERINGER, SETH AUBIN, William Mary College — Atom interferometers are extremely sensitive quantum measurement devices and are well suited for precision gravimetry. We present our progress in developing a new type of atom interferometer based on ultracold trapped atoms. The main benefit of a trapped atom interferometer is that, in principle, it can have a long phase integration time, which leads to a linear improvement in sensitivity over time. The development of our interferometer requires several proof-of-principle milestones to be accomplished. Notably, we have already reached our first milestone: we have implemented a trapped atom Ramsey interferometer with a coherence time in the 100 ms range. Our interferometer design is based on a Ramsey scheme whereby two different spin states are spatially separated by applying a microwave-based spin-dependent force generated by the AC Zeeman effect. The next milestone is to apply a spin-specific energy shift to one of the interferometer paths. For the final milestone, we will convert this energy shift into a force that will spatially separate the two interferometer paths. Our proof-of-principle interferometer is a first step towards building a compact, high precision gravimeter for remote detection of subterranean features.

[1]Work supported by NSF and DTRA, and in part by VMEC.

Shuangli Du
William
Mary College

Date submitted: 31 Jan 2020

Electronic form version 1.4