University of Liverpool Atom Interferometer Results and Upgrades

G. Elertas, O. Burrow, A. Carroll, J. Coleman, J. Heffer, C. Metelko, R. Moore, D. Morris, J. Tinsley, A. Webber-Date

Department of Physics
University of Liverpool
Oliver Lodge, Oxford Street, Liverpool, United Kingdom
e-mail: g.elertas@liverpool.ac.uk

An atom interferometer at the University of Liverpool has been developed at low-cost by employing common-off-the-shelf components with minor modifications, using ^{85}Rb as the atomic medium and a simplified two-laser optical system for state manipulation. This device is intended for dark content of the vacuum searches [1], as well as a test stand for inertial sensing applications. We can report the recent observation of Rabi oscillations and Ramsey fringes, see Fig. 1. [2]

The University of Liverpool atom interferometer is undergoing a major upgrade phase. The upgrade involves a new vacuum chamber, improved atom-optics set-up, an active vibration control system and a new detection system. A new vacuum chamber with larger viewports is necessary to accommodate larger trapping/cooling and atom manipulation laser beams. The new design allows the launch of atoms upwards into the atom interferometry region, increasing the time for phase difference to accumulate. Additional chambers for state selection and detection will be installed. The re-design of the experiment will also allow for the installation of a vibration isolation system, and two-dimensional magneto-optical trap to increase the repetition rate of the experiment.
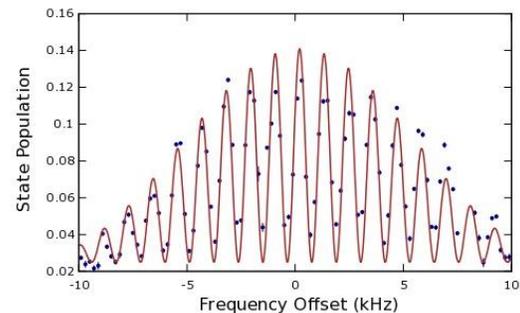

Figure 1: Ramsey fringes with a pulse gap of 0.8 ms. Total Raman power is around 8mW

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References

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[2] O. Burrow, A. Carroll, S. Chattopadhyay, J. Coleman, G. Elertas, J. Heffer, C. Metelko, R. Moore, D. Morris, M. Perl, J. Ralph, and J. Tinsley. arXiv:1705.09376, (2017).