Abstract Submitted
for the DAMOP14 Meeting of
The American Physical Society

Interacting sources for high-precision atom interferometry - a theoretical study[1] KATERINE POSSO TRUJILLO, HOLGER AHLERS, CHRISTIAN SCHUBERT, WOLFGANG ERTMER, ERNST RASEL, NACEUR GAALOUL , Institute for Quantum Optics - Leibniz University, Hannover — We theoretically study the possibilities to use binary quantum mixtures as sources for high-precision atom interferometers with interferometry times ranging over several seconds. Such schemes are of timely interest in the context of inertial navigation or fundamental physics laws tests. The mixture expansion dynamics are solved by integrating a set of two coupled Gross-Pitaevskii equations. In order to satisfy the severe requirements of a precise differential interferometer, a common delta-kick cooling stage is applied to the two ensembles simultaneously to induce ultra-slow expansion ($\sim$ 50 pk regime). Other systematic effects are analysed and mitigation strategies identified. To illustrate this study, we consider the case of three mixtures of ^{87}Rb/^{85}Rb, ^{87}Rb/^{39}K and ^{87}Rb/^{41}K widely used in atom interferometry measurements. The advantages and drawbacks of every pair are highlighted and discussed.

[1]K. Posso-Trujillo. thanks the German Academic Exchange Service - DAAD (research grant No. A/10/74250).

Katerine Posso Trujillo
Institute for Quantum Optics - Leibniz University, Hannover

Date submitted: 31 Jan 2014 Electronic form version 1.4