Abstract Submitted
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Study of the effect of dynamics of cold atoms in a magnetic guide on de Broglie wave interferometer[1] ALEXEY TONYUSHKIN, MARA PRENTISS, Harvard University — We present experimental study of dynamics of cold thermal atoms loaded into macroscopic magnetic guides [1] and its impact on the coherence of a de Broglie wave interferometer. Previous studies showed that cold atoms loaded into ferromagnetic guides exhibit oscillatory dynamics, which can be explained by the classical caustics formed by trajectories of individual atoms [2]. Such oscillatory patterns depend on the loading sequence, the atom's temperature, and the final field gradient. We show that caustics may limit the coherence time of the atom interferometer. In addition, the caustics may make it harder to achieve the quantum freeze limit, where slight misalignment of optical beams does not adversely affect the interaction time. In conclusion, the suppression of caustics in guided atom interferometers is important for increasing the sensitivity of atom-interferometer-based inertial sensors.

[1] A. Tonyushkin and M. Prentiss, submitted (2009), arXiv:0908.3504
[2] W. Rooijakkers *et al.*, PRA **68**, 063412 (2003).

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