Abstract Submitted
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High sensitivity atom interferometry measurement of the atom-surface interaction[1] VINCENT LONIJ, ALEX CRONIN, University of Arizona, STEVEN LEPOUTRE, HAIKEL JELASSI, GÉRARD TRÉNEC, MATTHIAS BÜCHNER, JACQUES VIGUÉ, University of Toulouse - UPS, IRSAMC, Toulouse, France — Atom interferometers are renowned for their ability to measure phase shifts with great precision. We have improved an atom interferometer experiment to measure phase shifts due to Van der Waals atom-surface interactions with enough precision to detect an unusual velocity dependence. We used standing waves of light, as beam splitters, and a nano-fabricated structure as a phase shifter. One arm of the Mach-Zehnder atom interferometer was transmitted through a nano-structure with 50 nm wide openings. Phase shifts due to this nano-structure exhibit a velocity dependence that is different from other, previously known, dispersive elements in atom-optics, such as electric fields or dilute gasses. The phase shifts for lithium atoms in the velocity range 700 to 2000 m/s depends on velocity to the power -0.49 (whereas for electric fields the phase shift depends on velocity to the power -1, and a dilute gas causes phase shifts that undulate as a function of velocity). We discuss the origin of this newly observed velocity dependence, and the utility of this experiment to measure Van der Waals C3 coefficients.

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