

Abstract Submitted
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Direct imaging of periodic sub-wavelength patterns generated by optical phase masks ALEXEI TONYUSHKIN, TYCHO SLEATOR, NYU — We demonstrated *direct* imaging of interference fringes of total atomic density with period $\lambda/4$ and $\lambda/2$ for optical wavelength λ that have been produced in de Broglie wave atom interferometer. The imaging was done by means of an “optical mask” technique¹, which allowed us to observe sub-wavelength periodic patterns with a resolution of up to $\lambda/16$. In addition, the dependence of the fringe pattern on the recoil phase and pulse areas reveals quantum dynamics in the atomic center-of-mass motion. The behavior of the fringe patterns near the interference times distinguishes the effects of phase gratings from those of amplitude gratings.²

¹A. Turlapov, A. Tonyushkin, and T. Sleator, PRA **68**, 023408 (2003).

²A. Tonyushkin, and T. Sleator, arXiv:physics/0512016 (2005).

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