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Experimental realization of a subwavelength optical potential based on atomic dark state YANG WANG, SARTHAK SUBHANKAR, Joint Quantum Institute and the University of Maryland, STEVEN ROLSTON, JAMES PORTO, Joint Quantum Institute, National Institute of Standards and Technology and the University of Maryland — As a well-established tool optical lattice (OL) provides the unique opportunity to exploit the rich manybody physics. However, "traditional" OL, either via laser beam interference or direct projection with spatial light modulator, has a length scale around the wavelength (0.1∼10 λ) that is set by diffraction, a fundamental limit from the wave nature of the light. Recent theoretical proposals [1] [2] suggest an alternative route, where the geometric potential [3], stemming from light-atom interaction, can be engineered to generate a much finer potential landscape which is essentially limited by the wave nature of the slow moving cold atoms. We report on the progress towards an experimental realization of these ideas using degenerate fermionic ytterbium atoms. Such subwavelength optical potential could open the gate to study physics beyond currently available parameter regimes, such as enhanced super-exchange coupling, magnetic dipolar coupling, and tunnel junction in atomtronics.

[1]M. Łacki *et al*, Phys. Rev. Lett **117**, 233001 (2016)
[2]F. Jendrzejewski *et al.* Phys. Rev. A **94**, 063422 (2016)
[3]M. Cheneau, *et al.* EPL **83**, 60001 (2008)

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