

Abstract Submitted  
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**Artificial Relativity with Optical Lattices** J.Y. VAISHNAV, CHARLES W. CLARK<sup>1</sup>, Joint Quantum Institute, National Institute of Standards and Technology, Gaithersburg MD 20899 — A driving force behind the study of ultracold atoms is the idea of “quantum simulation” of other physical systems, including systems which may not be accessible in their original manifestations. In this talk, we discuss how to use optical lattice setups to generate a variety of effective Hamiltonians which resemble the Dirac Hamiltonian for a relativistic electron. Engineering such Hamiltonians suggests the possibility of a variety of experiments, including cold atom versions of *Zitterbewegung*<sup>2</sup>, spintronic transistors<sup>3</sup>, and topological insulators<sup>4</sup>.

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<sup>2</sup>J. Y. Vaishnav, Charles W. Clark. *Phys. Rev. Lett.*, **100**, 153002 (2008).

<sup>3</sup>J. Y. Vaishnav, Julius Ruseckas, Charles W. Clark, Gediminas Juzeliunas. *Phys. Rev. Lett.*, **101**, 265302 (2008).

<sup>4</sup>T. D. Stanescu, V. Galitski, J. Y. Vaishnav, Charles W. Clark. Preprint.

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