Abstract Submitted
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Observing Zitterbewegung with Ultracold Atoms J.Y. VAISHNAV, CHARLES W. CLARK, National Institute of Standards and Technology — We propose an optical lattice scheme which would permit the experimental observation of *Zitterbewegung* (ZB) with ultracold, neutral atoms. A four-level "tripod" variant of the usual setup for stimulated Raman adiabatic passage (STIRAP) has been proposed for generating non-Abelian gauge fields [1]. Dirac-like Hamiltonians, which exhibit ZB, are simple examples of such non-Abelian gauge fields; we show how a variety of them can arise, and how ZB can be observed, in a tripod system. We predict that the ZB should occur at experimentally accessible frequencies and amplitudes. We also discuss how the tripod STIRAP setup can be used to generate atomic versions of various spintronic devices.
[1] J. Ruseckas, G. Juzeliūnas, P. Öhberg, M. Fleischhauer, *Physical Review Letters* **95**, 010404 (2005).

J.Y. Vaishnav
National Institute of Standards and Technology

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