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Observing *Zitterbewegung* **in Ultracold Atoms** J.Y. VAISHNAV, CHARLES W. CLARK, Joint Quantum Institute, National Institute of Standards and Technology, Gaithersburg MD 20899 — 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.
[1] J. Ruseckas, G. Juzeliūnas, P. Öhberg, M. Fleischhauer, *Physical Review Letters* **95**, 010404 (2005).

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