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Pattern formation in time-of-flight images of heavy-light mixtures of atoms undergoing Bloch oscillations[1] JAMES FREERICKS, Department of Physics, Georgetown University — Nonequilibrium dynamical mean-field theory is employed to solve for the response of a light-heavy Fermi-Fermi mixture of atoms to the presence of a uniform electric field (via "pulling" the lattice through the cloud of atoms). When we express the (momentum-dependent) light atom distribution functions as functions of the band energy and the projection of the velocity along the direction of the artificial electric field, the system develops characteristic spiral patterns that become more complex as the system evolves, but remain stable for a long period of time. These patterns typically show a contrast of about 10-20% fluctuations about the mean density, so they are challenging but possible to observe in a time-of-flight measurement. We also show a characteristic change of character of the system between small fields and large fields. The best candidate system for examining these patterns is a Li^6-K^{40} mixture on a two-dimensional optical lattice. We expect similar results should occur for light Fermi-heavy Bose mixtures as well, but it is likely this behavior will not be seen in Bose-Bose mixtures.

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