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Semiclassical Equations of Motion for Bloch Electrons in External Fields, Including Spin-Orbit Interaction. W.C. KERR, Wake Forest U. — This talk considers an electron moving in a periodic potential with spin-orbit interaction and perturbed by external slowly varying electric field and uniform magnetic field. Superposition of the time-independent Bloch spinor states of the unperturbed Hamiltonian gives a wave packet state with both wavevector space and spin-orientation amplitude factors. The time-dependent variational principle produces equations of motion for the centers of the wave packet in both configuration and wavevector space and for the spin-orientation factors. For spinless electrons this procedure yields the familiar semiclassical equations of motion augmented by an orbital magnetic moment contribution to the Bloch band energy and an "anomalous velocity" proportional to a Berry curvature.[1] The inclusion of spin-orbit interaction gives additional contributions to the velocity involving different Berry curvatures. One is a spin-dependent contribution to the magnetic moment, and another is an electric-dipole-like contribution that is also proportional to the spin operator.

[1]M. C. Chang & Q. Niu, Phys. Rev. B **53**, 7010 (1996)

[X] Prefer Oral Session
[ ] Prefer Poster Session

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