Abstract Submitted
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Breathing oscillations accompanying Bloch oscillations of wavepackets in periodic potentials[1] MIGUEL PRUNEDA, UC Berkeley, IVO SOUZA, UC Berkeley — Using a 1D tight-binding model, we study the evolution of a well-localized wavepacket of Bloch states under an applied electric field. We apply a novel algorithm [2] for solving numerically the equations of motion which does not rely on the single-band approximation and can thus be used to explore interband Zener tunneling effects. In addition to the well-known Bloch oscillations of the center of the packet, we show that as the waveform moves in k-space, its real-space width varies in response to the change in the local quantum metric, [3] $g(k)$, of the underlying Bloch states. A generalized uncertainty relation is obtained between the spread in position and in *crystal* momentum of a wavepacket. It differs from the usual position/momentum uncertainty relation because of the interband matrix elements of the position operator in the crystal-momentum representation, which introduce a correction in terms of $g(k)$.

[1]Marie Curie OIF programme
[2]along the lines of I. Souza *et. al.*, Phys. Rev. B **69**, 085106 (2004)
[3]N. Marzari and D. Vanderbilt, Phys. Rev. B **56**, 12 847 (1997).

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