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Are there quantum oscillations in an incommensurate charge density wave? YI ZHANG, AKASH MAHARAJ, STEVEN KIVELSON, Stanford University — Because a material with an incommensurate charge density wave (ICDW) is only quasi-periodic, Bloch's theorem does not apply and there is no sharply defined Fermi surface. We will show that, as a consequence, there are no quantum oscillations which are truly periodic functions of 1/B (where B is the magnitude of an applied magnetic field). For a weak ICDW, there exist broad ranges of 1/B in which approximately periodic variations occur, but with frequencies that vary inexorably in an unending cascade with increasing 1/B. For a strong ICDW, e.g. in a quasi-crystal, no quantum oscillations survive at all. Rational and irrational numbers really are different. The duality between quasi-periodic systems in different dimensions can be straightforwardly generalized beyond the quantum oscillations and provides an accurate and efficient perspective.

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