An ideal rapid-cycle Thouless pump

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Thouless pumping is a fundamental instance of quantized transport, which is topologically protected. Although its theoretical importance, the adiabaticity condition is an obstacle for further practical applications. Here, focusing on the Rice-Mele model, we provide a family of finite-frequency examples that ensure both the absence of excitations and the perfect quantization of the pumped charge at the end of each cycle. This family, which contains an adiabatic protocol as a limiting case, is obtained through a mapping onto the zero curvature representation of the Euclidean sinh-Gordon equation.