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A quantum resonance catastrophe for a periodically driven impurity SEBASTIAN EGGERT, Univ Kaiserslautern, DANIEL THUBERG, SEBASTIÁN REYES, Pontificia Universidad Católica de Chile — There has been much interest in creating novel quantum states through active dynamic manipulations (quenches and driving) in a variety of state-of-the-art systems, such as molecular electronics, ultra-cold quantum gases, nanodot arrays, and photonic crystals. We now consider the transport in an extended one-dimensional array of coupled quantum sites which is periodically driven at one impurity location by using an exact solution with help of the Floquet theory. While a static potential barrier is known to always allow transport via tunneling, a corresponding time-periodic impurity shows resonances at special driving frequencies where the transmission is completely blocked. We find that even for an infinitesimally small periodic perturbation there is a breakdown of conductance. Such a quantum resonance catastrophe occurs when the frequency is tuned to couple to bound states just outside the band. Our results show an abundance of tuning possibilities for the transmission and the width of the resonance with frequency, potential barrier and particle energy, leading to versatile opportunities in the design of switches.

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