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Fano effect in quantum wires with a uniform transverse electric field V. VARGIAMIDIS, Aristotle University, Thessaloniki, Greece, V. FESSATIDIS, Fordham University, Bronx, USA — We investigate the effect of an external uniform transverse electric field on the Fano resonance in electronic transport of a quantum wire with a finite range impurity. We employ the Feshbach coupled-channel theory for calculating the transmission probability. The attractive impurity is Pöschl-Teller along the propagation direction but is an arbitrary function of the lateral coordinate. For this type of impurity analytical solution to the scattering problem is possible. The Fano line shape resulting from the interference of direct transmission and transmission via a quasibound state created in the impurity, is shown to be strongly affected by the strength of the electric field. In particular, we show that as the strength of the electric field increases the resonance width continuously decreases and finally shrinks to zero. Consequently, the Fano line shape collapses. The vanishing of the resonance width indicates the transformation of the quasibound state into a true bound state in the continuum. Depending on the strength of the impurity, the collapse of the Fano line shape can even occur in the regime of weak electric field. This interesting collapsing behavior of the Fano resonance has also been shown to occur in purely one-dimensional systems (i.e., in 1D mesoscopic open rings). We also examine the pole structure of the transmission amplitude, in the complex energy plane, as a function of the electric field strength.

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