

## **Mesoscopic to universal crossover of transmission phase of multi-level quantum dots**

**Transmission phase ( $\alpha$ ) measurements of many-electron quantum dots (small  $\delta$ ) revealed universal phase lapses by  $\pi$  between consecutive resonances. In contrast, for dots with only a few electrons (large  $\delta$ ) the appearance or not of a phase lapse depends on the dot parameters. We show that a model of a multi-level quantum dot with local Coulomb correlations and arbitrary level-lead couplings reproduces the generic features of the observed behavior. Universal behavior arises when the level spacing  $\delta$  is small compared to the average level width, and follows from Fano-type antiresonances of pairs of renormalized single-particle levels.**

**Reference: C. Karrasch, T. Hecht, A. Weichselbaum, Y. Oreg, J. von Delft, and V. Meden, Phys. Rev. Lett. 98, 186802 (2007).**