INTERFERENCE AT AVOIDED CROSSINGS: TRANSPORT, DECOHERENCE, AND BICHROMATIC DRIVING

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Double quantum dots with long coherence times allow the implementation of coherent tunnel phenomena. For instance, if an energy level of one dot is swept such that it crosses a level of the other dot, one observes Landau-Zener transitions. Repeated sweeps lead to the so-called Landau-Zener-Stückelberg-Majorana interference visible in a characteristic pattern as a function of the detuning and the amplitude of the sweeps. The experimentally observed fading of this interference pattern with increasing temperature is explained in terms of a transport calculation for which a coupling to bulk phonons causes decoherence. The comparison with experimental data allows us to determine the parameters of the system-bath model and to draw conclusions about the coherence time of charge qubits implemented with double quantum dots [1].
When driving the system with two frequencies, the symmetry of the interference pattern depends on their commensurability. In particular, for commensurable frequencies, the symmetry depends on the relative phase between the two components, while in the incommensurable case, one finds the higher symmetry which otherwise is only found for certain phases. These predictions are confirmed by measurements [2].

[1] F.Forster, G. Petersen, S. Manus, P. Hänggi, D. Schuh, W. Wegscheider, S. Kohler, and S. Ludwig, Phys. Rev. Lett. 112, 116803 (2014).

[2] F. Forster, M. Mühlbacher, R. Blattmann, D. Schuh, W. Wegscheider, S. Ludwig, and S. Kohler, Phys. Rev. B 92, 245422 (2015).