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Tunneling control and phase dependent phenomena in a two-level system NELSON STUDART, UFSCar, Brazil, JOSE M. VILLAS-BOAS, SERGIO ULLOA, Ohio University — The search for an ideal qubit has resulted in the study of structures composed of effective two level systems, including double quantum dots, small molecules, and superconducting junctions. The dynamical manipulation of such systems is then of great broad interest. One common approach is to drive the system with an oscillating field, which is known to produce the interesting phenomenon of coherent destruction of tunneling (CDT) [1]. We have reported previously on the degree of localization (or the ability to block the tunneling) in this system, and how it decreases by lowering the frequency of the driving field [2]. In this work we show that this localization is in fact highly dependent on the *phase* of the drive, which makes this phenomenon even richer and more interesting, with possible application to quantum information. We report here how to use this effect to control the rotation of the equivalent qubit on the Bloch sphere and how the phase can produce a well- controlled ‘revival of the localization. Supported by the Indiana 21st Century Research and Technology Fund, and FAPESP-Brazil. [1] M. Grifoni and P. Hänggi, Phys. Rep. **304**, 229 (1998). [2] J. M. Villas-Bôas, W. Zhang, S. E. Ulloa, P. H. Rivera, and N. Studart, Phys. Rev. B **66**, 085325 (2002).

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