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Dynamical magnetoelectric feedback effects in magnetic resonant tunneling structures[1] CHRISTIAN ERTLER, JAROSLAV FABIAN, Institute for Theoretical Physics, University of Regensburg — Heterostructures made of stacked layers of both magnetic and nonmagnetic semiconductors provide a lot of opportunities for controlling and tuning their spin-dependent transport properties. For instance, highly efficient spin valves,spin switching and spin filtering devices have been demonstrated by using magnetic resonant tunneling structures [1]. Here, we show that in a resonant tunneling double barrier structure, which comprises a ferromagnetic quantum well made of a dilute magnetic semiconductor material, interesting dynamical effects can occur [2]. In such systems the transport and magnetic properties become strongly coupled, since the ferromagnetic order in the quantum well is mediated by the itinerant carriers. Both the Coulomb interaction of the particles and the magnetic exchange field give rise to strong feedback effects on the tunneling current. Interestingly, for a broad voltage range self-sustained high-frequency oscillating currents associated with an oscillating well magnetization appear. The requirements for the occurrence of these dc-driven magnetoelectric oscillations are investigated and possible device setups, which should allow for an experimental observation, are discussed. [1] J. Fabian, A. Matos-Abiague, C. Ertler, P. Stano and I. Zutic, Acta Phys. Slov. 57, 565 (2007). [2] C. Ertler and J. Fabian, Phys. Rev. Lett. 101, 077202 (2008).

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