PHASE DIAGRAMS AND SWITCHING OF VOLTAGE AND MAGNETIC FIELD IN DILUTED MAGNETIC SEMICONDUCTOR NANOSTRUCTURES

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We investigate the response of a n-doped dc voltage biased II-VI multi-quantum well diluted magnetic semiconductor nanostructure having its first well doped with magnetic impurities (Mn) under both voltage and magnetic-field abrupt switching.

Transitions between stationary states and self-sustained current oscillations are systematically analyzed, obtaining the phase diagram of voltage versus level splitting induced by an external magnetic field. The phase diagram shows regions of stable self-sustained current oscillations immersed in a region of stable stationary states. Sudden voltage or magnetic field changes may switch or disconnect current oscillations from an initial stationary state, and reciprocally, current oscillations may disappear after sudden changes of voltage or magnetic field changes into the stable stationary states region.

Our results show how to design a device operating as a spin injector and a spin oscillator by tuning the Zeeman splitting (through the applied external magnetic field and the density of magnetic impurities) and the parameters determining the sample configuration (number of wells, doping density, barrier and well widths, . . .).

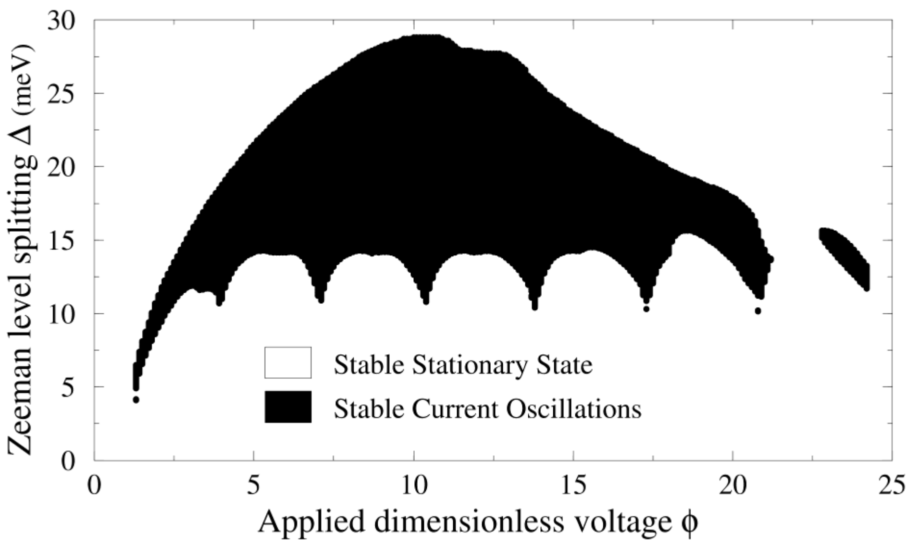

Fig. Phase diagram of Δ vs. ϕ showing regions of stable self-sustained current oscillations immersed in a region of stable stationary states in a 10-wells superlattice.

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