

Chaotic patterns and localized states in spin valves

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© 2019 Elsevier B.V. Driven nano-magnets have attracted increasing attention due to their potential applications and complex dynamical behavior. Spin valves are possibly the most studied driven nano-magnets because applied magnetic fields and electric currents can control their magnetization. Due to these properties, spin valves are proposed candidates for the new generation of memory units. Based on the Landau-Lifshitz-Gilbert-Slonczewski equation, we show that this system exhibits a wide range of magnetization textures, such as patterns, domain walls, and localized structures. Monitoring the Largest Lyapunov exponent, we demonstrate that these textures are chaotic. We numerically characterize the dynamical behavior of this device using the magnetic energy and the magnetoresistance. Finally, we present a phase diagram of the different types of spatial solutions as a function of the applied current and the field.