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Stochastic Resonance Driven by Spin Torque XIAO CHENG, CARL BOONE, JIAN ZHU, ILYA KRIVOROTOV, University of California Irvine, UNIVERSITY OF CALIFORNIA IRVINE TEAM — Application of a microwave ac current to a spin valve gives rise to a rectified voltage due to magnetization dynamics driven by ac spin torque. We study the effect of dc current bias on these dynamics in spin valves with superparamagnetic free layers. We observe large enhancement of the rectified voltage (up to two orders of magnitude) along a line in the dc current - magnetic field phase diagram of the system. This enhancement arises from large-amplitude nonlinear dynamics of magnetization of the free layer induced by the combined action of ac and dc spin torques. For small out-of-plane external magnetic field, the enhanced rectified signal is observed at low frequencies (<1GHz) of the ac drive. This signal enhancement arises from adiabatic stochastic resonance of magnetization of the free layer driven by ac spin torque. For large out-of-plane magnetic field, the rectified signal enhancement is found at the ac drive frequencies of several GHz. We interpret this new type of large-amplitude high-frequency dynamics as non-adiabatic stochastic resonance of magnetization. Temperature-dependent measurements of the rectified signal confirm the stochastic resonance nature of the observed phenomena.

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