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Noise-enhanced synchronization of stochastic magnetic oscillators[1] JULIE GROLLIER, ALICE MIZRAHI, CNRS/Thales, Palaiseau, France, NICOLAS LOCATELLI, Institut d'Electronique Fondamentale, Orsay, France, ARTUR ACCIOLY, Instituto de Fisica, Univ. Federal do Rio Grande do Sul, Porto Alegre, Brazil, RIE MATSUMOTO, AKIO FUKUSHIMA, HITOSHI KUBOTA, SHINJI YUASA, National Institute of Advanced Industrial Science and Technology (AIST), Tsukuba, Japan, VINCENT CROS, CNRS/Thales, Palaiseau, France, LUIS GUSTAVO PEREIRA, Instituto de Fisica, Univ. Federal do Rio Grande do Sul, Porto Alegre, Brazil, DAMIEN QUERLIOZ, JOO-VON KIM, Institut d'Electronique Fondamentale, Orsay, France — Due to their small magnetic volume the magnetization dynamics of spin-torque nano-oscillators is very sensitive to thermal fluctuations. This results in a large phase noise detrimental to their phase-locking. Here, we pursue an original paradigm in which noise is advantageous for improving coherence and facilitating synchronized states. This builds upon recent work in which spin torque driven magnetic tunnel junctions have been shown to exhibit stochastic resonance. Our system comprises a magnetic tunnel junction with a super-paramagnetic free layer, whose magnetization dynamics is driven with spin torques through an external periodic current. We show synchronization of this stochastic oscillator at very low current densities (below 3 10^6 A/cm^2) and input frequencies lower than the natural mean frequency of the oscillator. We show that such injection-locking is robust and leads to a drastic reduction in phase diffusion of the oscillator. This system is promising for applications where low energy is crucial and thermal noise has to be leveraged, such as bioinspired computing.

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