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Nanoconstriction-based Spin Hall nanooscillator ANDREI ZHOLUD, SERGEI URAZHDIN, Emory University, VLADISLAV DEMIDOV, SERGEJ DEMOKRITOV, University of Muenster — We experimentally demonstrate coherent magnetization oscillations induced in a bow tie-shaped Pt/Permalloy nanoconstriction by pure spin current generated by the spin Hall effect. The devices generate microwave signals with a significant power and the spectral linewidth as low as 6.2 MHz at room temperature (RT). In contrast to the previously demonstrated spin Hall oscillators governed by the dynamical nonlinear self-localization mechanism, the localized oscillation mode is present in the thermal fluctuation spectrum even below the auto-oscillation onset and exhibits a significant redshift. These observations suggest that the localized auto-oscillation mode is formed due to the confinement in an effective potential well produced by a combination of the dipolar field of the magnetic nanoconstriction and the Oersted field of electrical current. The studied devices are characterized by a large oscillation area, minimizing the effects of thermal fluctuations and resulting in a narrow RT spectral linewidth without compromising the single-mode regime of autooscillation. Moreover, the simple planar structure of the proposed oscillators enables their cascading, which can be utilized to further improve the oscillation characteristics in mutually coupled devices.

Andrei Zholud
Emory Univ

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