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Frequency-doubling spin-torque microwave oscillator GRAHAM ROWLANDS, ILYA KRIVOROTOV, University of California Irvine — We describe a new type of spin torque oscillator with two free layers that is capable of emitting high microwave power (> 1 μW) at high frequency (> 50 GHz) in zero external field. This device has two perpendicular-anisotropy fixed ferromagnetic layers and two easy-plane free layers sandwiched between the fixed layers, with all of the magnetic layers separated from each other by non-magnetic spacers. We simulate current-driven magnetization dynamics in this structure in the macrospin approximation, taking into account spin-torque interactions between adjacent ferromagnetic layers. Our simulations show that for both fixed layers magnetized in the same direction perpendicular to the plane of the sample, spin-torque induces clockwise rotation of one of the layers and counterclockwise rotation of the other. This type of current-driven dynamics gives rise to large-amplitude microwave signal with the frequency that is the sum of the precession frequencies of the free layers. We study the effect of dipolar coupling, shape anisotropy and external field on the dynamics of this spin torque oscillator and determine the optimal device parameters for high-amplitude high-frequency microwave signal generation.

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