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Spin Hall effect excited parametric resonance in permalloy/platinum nanowires LIU YANG, ZHENG DUAN, ANDREW SMITH, BRIAN YOUNGBLOOD, ILYA KRIVOROTOV, UC Irvine — We report measurement of Spin Hall effect excited parametric resonance of spin wave modes in Permalloy (Py) / Platinum (Pt) bilayer nanowires. The excitation of the parametric resonance is assisted by spin torque from direct Spin Hall current generated in the Pt layer, which acts like effective negative magnetic damping on Py magnetization. A saturating in-plane magnetic field is applied perpendicular to the wire axis. We simultaneously apply a direct and a microwave current to the nanowire and measure voltage as a function of magnetic field. At approximately twice the frequency of the spin wave eigenmodes in the Py wire in the field range used in the experiment, peaks in voltage versus field are observed above a threshold value of the ac current. The double frequency of the drive and the threshold character of the excitation demonstrate the parametric nature of the excited resonance. We also measured the dependence of the voltage peak amplitude on the microwave current amplitude measured for several values of the direct current bias applied to the nanowire. It's found that the threshold ac current shifts to lower values at higher dc bias, indicating that dc spin Hall current injected from Pt into Py reduces the effective damping in the Py layer.

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