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Comparison of spin transfer mechanisms in three terminal spin-torque-oscillators EMILIE JUE, WILLIAM RIPPARD, MATTHEW PUFALL, ERIC R. EVARTS, NIST - Boulder, QUANTUM ELECTROMAGNETICS DIVISION TEAM — The manipulation of magnetization by electric current is one of the most active field of spintronics due to its interests for memory and logic applications. This control can be achieved through the transfer of angular momentum via a spin polarized current (the mechanism of spin-transfer torque - STT) or through a direct transfer of angular momentum from the crystal lattice through the spin-orbit interaction (the mechanism of spin-orbit torque - SOT). Over the five past years, SOT gained a lot of attention especially for the new possibilities that it offers for data storage application. However, the quantification and the comparison of both mechanisms' efficiencies remains uncertain. In this work, we compare for the first time the STT and SOT efficiencies in individual devices. For this, we created 3-terminal spin-torque oscillators (STO) composed of spin-valves (SV) on top of a Pt wires. The devices can be excited either by STT or by SOT depending on whether the current is applied through the SV or through the Pt wire. By varying the Pt width and the dimensions of the SV, we tune the SOT and STT and compare their efficiencies. We will discuss the complexity of such a structure and the differences in the magnetization dynamics induced by the different excitation mechanisms.

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