Search for Pure Spin Currents in the Damping of Ultrathin Films: Stroboscopic XMCD Studies

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The Gilbert damping is a fundamental property of metallic ferromagnets, important in high-frequency applications. Size effects in the Gilbert damping have been observed nearly universally, with α/G increasing markedly with decreasing film thickness $t_{FM} < 10$ nm. Additional size effects are nonlocal, originating from scattering centers removed from the FM layer itself. The nonlocal damping size effect has been interpreted on the basis of pure spin current being "pumped," coherently, out of a precessing FM layer and intro a spin-sinking remote layer, with attendant loss of angular momentum. The "spin pumping" effect is experimentally well-established in epitaxial Fe/Au/Fe heterostructures. I will describe our experimental search for this effect in ultrathin, polycrystalline FM/NM/FM and FM/NM/Pt heterostructures using ferromagnetic resonance (FMR) and time-resolved XMCD.

Collaborator credit: Ursula Ebels, SPINTEC/CEA, Grenoble; Dario Arena/ Peter Warnicke, BNL/NSLS