Interfacing canted magnon modes with spin centers in hBN

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Poster abstract:

Hybrid Quantum Systems (HQS) have increasingly attracted much attention as a platform for on-chip long-distance entanglement and interfacing quantum information science with magnonics [1,2,3]. In this work, we study an HQS composed by spin-centers in multilayer hBN [4] interacting with magnons in a permalloy thin film under an out-of-plane external magnetic field. Due to anisotropy, the magnetization initially in the permalloy plane is tilted with increasing field intensity, giving rise to canted magnon modes. The magnon frequencies and profiles are obtained using a semi-analytical Hamiltonian approach accounting for Zeeman, anisotropy, and dipole interaction. We then compute the corresponding spin-magnon coupling strength alongside the magnon-induced T1 relaxation rate. We further compare our theoretical results with experimental data, where optically detected magnetic resonance (ODMR) measurements confirm the coupling between spin centers and canted magnon modes.

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