

Spin-Wave Excitation in Ferromagnet with Superconductive Nanostructures

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A growing interest in hybrid systems for quantum computing necessitates the operation of magnonic conduits at low temperatures and in superconducting circuit environments. In such systems, eddy currents in superconductors shield the internal magnetic field, leading to the formation of an external stray field. This stray field, which can be controlled by an external dynamic magnetic field, can influence the magnetization dynamics of nearby magnetic layers and structures [1,2].

In our study, we investigate the impact of stray magnetic fields generated by superconducting stripe arrays on spin-waves excited in an adjacent ferromagnetic layer. The sample was cooled down in a cryogenic system to explore a broad temperature range, including temperatures below and above the critical temperature of niobium (9 K). A homogeneous RF magnetic field in the frequency range of 0–15 GHz was applied using a Vector Network Analyzer (VNA), which simultaneously recorded the absorption response of the magnetic layer. The measured absorption spectra across 5–270 K are complemented by theoretical calculations performed using the *SpinWaveToolkit* Python package [3].

References:

- [1] J. Kharlan, K. Szulc, J. W. Klos, *Sci. Rep.* **14** (2024) 25594
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