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Photon-magnon interaction in ferromagnets of different sizes

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We present our first steps towards the coherent coupling between inhomogeneous magnon excitations and resonant photons living in a superconducting cavity. Using a coplanar superconducting transmission line, we perform broad-band ferromagnetic resonance of thin-film mesoscopic magnets. This allows identifying the low-energy Kittel spin-wave excitation (with infinite wavelength). By patterning gap capacitors, we transform this transmission line into a cavity where resonant photons strong couple to the Kittel mode, as evidenced by the observation of an anti-crossing in the transmission spectra. We also develop the theory for coupling between magnetic textures (vortices and skyrmions) and microwave photons.

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