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Spectral hole burning and its application in microwave photonics[1]

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— In microwave photonics, electron spin ensembles are candidates for use as quantum memories with potentially long storage times. Here, we demonstrate the creation of long-lived collective dark states by spectral hole burning in the microwave regime. The coherence time in our hybrid quantum system (nitrogenvacancy centres strongly coupled to a superconducting microwave cavity) becomes longer than both the ensembles free-induction decay and the bare cavity dissipation rate. The hybrid quantum system thus performs better than its individual subcomponents. We demonstrate the creation of multiple pairs of dark states, which opens the way for long-lived quantum multimode memories and solid-state microwave frequency combs.

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