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Cavity mediated coherent coupling between yttrium iron garnet magnets NICHOLAS LAMBERT, University of Cambridge, JAMES HAIGH, Hitachi Cambridge Laboratory, STEFAN LANGENFELD, University of Cambridge, ANDREW DOHERTY, University of Sydney, ANDREW FERGUSON, University of Cambridge — Strong coupling between the magnetostatic modes of an yttrium iron garnet (YIG) magnet and a microwave frequency electromagnetic cavity is now readily achievable[1,2,3]. Recently, coupling between a magnon and a superconducting qubit mediated by a cavity has also been demonstrated[4]. In this talk, we describe dispersive measurement[5] of the cavity-mediated coupling of magnetostatic modes in two YIG magnets. We find they are strongly coupled even when detuned from the cavity modes. We study the strength of the coupling as a function of the detuning, and find a $1/\Delta$ dependence when close to individual cavity modes. Dark states of the coupled magnets are observed, in which the symmetry of the microwave drive does not match that of the new eigenstates. Our results are described well within the framework of circuit QED. Such an approach to coupling magnets might be used to phase-lock many spatially separated magnetic oscillators, such as those in spin-torque nano-oscillators or magnetic metamaterials. [1] Huebl et al., Phys. Rev. Lett., 111, 127003 (2013) [2] Zhang et al., Phys. Rev. Lett., 113, 156401 (2014) [3] Lambert et al., J. Appl. Phys., 117, 053910 (2015) [4] Tabuchi et al., Science, 349(6246), 405408 (2015) [5] Haigh et al., Phys. Rev. B, 91, 104410 104410 (2015)

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