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# Cavity mediated non-local manipulation of spin current using cavity-magnon-polariton

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As a strongly coupled magnon-photon system, the cavity-magnon-polariton (CMP) offers many potential applications for information processing. Typically such information processing applications would require manipulation of the energy exchange between the magnon and photon subsystems which, in a CMP system, relies on the cooperativity and can therefore be easily controlled. However in order to measure the extent of such an exchange, the spin subsystem must be locally detected. This obstacle can be overcome through electrical detection techniques. In our work we have combined electrical detection via the spin pumping effect with microwave transmission measurements in order to locally detect both the individual photon and spin subsystems of the CMP in a system comprised of one microwave cavity mode and two magnetic samples. Through controlling the cooperativity of one magnetic sample, while locally detecting another, we demonstrate a non-local spin current manipulation mediated by the cavity mode. We have demonstrated such a non-local spin current manipulation over a spatial separation up to 38 mm (limited only by the cavity size), which is orders of magnitude longer than either the spin coherence or diffusion length in materials. Therefore our work demonstrates the capability of strong spin-photon coupling for long range spin current manipulation, which we expect to play an important role in the development of cavity spintronics.

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