

## Critical charge and spin Josephson currents through a precessing spin

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We present a theoretical study of two superconductors coupled over a spin. The spin is treated classically and is assumed to precess with the Larmor frequency due to an external magnetic field. The precession results in spin-dependent Andreev scattering and a non-equilibrium population of the Andreev levels. Charge and spin currents at zero temperature were studied previously.<sup>1</sup> Here, we focus on the critical current as well as the corresponding spin currents at finite temperatures. At finite temperatures, the spin precession can enhance the supercurrent by a population redistribution. The enhancement leads to a modified current-phase relation and a non-monotonous critical current as function of temperature. This non-monotonous behavior is accompanied by a corresponding change in spin-transfer torques acting on the precessing spin and leads to the possibility of using temperature as a means to tune the back-action on the spin.

<sup>1</sup>C. Holmqvist, S. Teber, and M. Fogelström, Phys. Rev. B **83**, 104521 (2011).