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Non-equilibrium effects in a Josephson junction coupled to a precessing spin CECILIA HOLMQVIST, Chalmers University of Technology, SOFIAN TEBER, LPTHE, Universites Paris 6 et 7, CNRS, MANUEL HOUZET, CEA, Grenoble, DENIS FEINBERG, CNRS and UJF, Grenoble, MIKAEL FOGELSTROM, Chalmers University of Technology — We present a theoretical study of a Josephson junction consisting of two s-wave superconducting leads coupled over a classical spin. When an external magnetic field is applied, the classical spin will precess with the Larmor frequency. This magnetically active interface results in a time-dependent boundary condition with different tunneling amplitudes for spin-up and spin-down quasiparticles and where the precession produces spin-flip scattering processes. We show that as a result, the Andreev states develop sidebands and a non-equilibrium population which depend on the precession frequency and the angle between the classical spin and the external magnetic field. The Andreev states lead to a steady-state Josephson current whose current-phase relation could be used for characterizing the precessing spin. In addition to the charge transport, a magnetization current is also generated. This spin current is time-dependent and its polarization axis rotates with the same precession frequency as the classical spin.

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