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**Observation of spin-bottleneck due to spin-charge separation in a superconductor** BRIGITTE LERIDON, JEROME LESUEUR, MARCO APRILI, Laboratoire de Physique Quantique - ESPCI - Paris — Quasiparticles were injected from a ferromagnet ($Ni_{0.8}Fe_{0.2}$) through a tunnel junction into a conventional superconductor (Nb), while the density-of-states of the superconductor was measured through a second tunnel junction with a paramagnet. No significant decrease of the superconductive gap was observed while a noticeable heating of the quasiparticles of the superconductor was measured. A similar experiment performed with current injected from a paramagnet showed no such effect. This can be interpreted in terms of an enhanced recombination time for the spin-polarized quasiparticles. Estimations give for the intrinsic recombination time a value of about $10^{-9}$ s at 2 K, while some measurements of the spin relaxation time in superconducting Nb give about $10^{-8}$ s at the corresponding temperature (Vier, Phys. Lett. A 98, 283, 1983). The existence of intrinsic spin-charge separation in a superconductor (see Kivelson Phys. Rev. B 41, 11693, 1990) is indeed responsible for a decrease of the spin-orbit coupling matrix coefficients leading to infinite spin-relaxation time at zero temperature (as calculated by Yafet, Phys. Lett. A 98, 287, 1983). In our experiment, it ensures a large spin-relaxation time, thus blocking the recombination process and acting as a "spin-bottleneck". Due to the geometry of the experiment, the pure spin excitations are spatially separated from the charge and are able to thermalize above the gap edge.

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