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Spin-Josephson effect in antiferromagnetic tunnel junctions[1] DOMINIQUE CHASSE, A-M.S. TREMBLAY, Universite de Sherbrooke — In the Josephson effect, coherent Cooper pair tunneling is driven by the phase difference between the superconducting order parameters on opposite sides of the junction. By analogy, differences in order parameters across a junction should lead to coherent tunneling of the condensed objects that exist in the broken symmetry state. To exhibit the generality of this phenomenon and make predictions from a realistic model, we study the case of a tunnel junction between two itinerant antiferromagnets. At the mean-field level, we find an equilibrium current of the staggered magnetization through the junction that is proportional the normal state conductance and to $\mathbf{S_L} \times \mathbf{S_R}$ where $\mathbf{S_L}$ and $\mathbf{S_R}$ are the staggered magnetizations on either sides. Microscopically, this effect comes from coherent tunneling of spin-one charge-zero particle-hole pairs that have a net wave vector equal to the antiferromagnetic one and zero spin projection along the direction of the order parameter. We explain similarities and differences with the standard DC and AC Josephson effects.

[1]CRSNG, CRC, CIFAR

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