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Quantum limit of the triplet proximity effect in half-metal - superconductor junctions JOERN N. KUPFERSCHMIDT, LASSP, Cornell University, B. BÉRI, C.W.J. BEENAKKER, Instituut-Lorentz, Universiteit Leiden, P.W. BROUWER, LASSP, Cornell University — We apply the scattering matrix approach to the triplet proximity effect in superconductor-half metal structures. We find that for junctions that do not mix different orbital modes, the zero bias Andreev conductance vanishes, while the zero bias Josephson current is nonzero. We illustrate this finding on a ballistic half-metal/superconductor (HS) and superconductor/half-metal/superconductor (SHS) junction with translation invariance along the interfaces, and on HS and SHS systems where transport through the half-metallic region takes place through a single conducting channel. Our calculations for these physically single mode setups single mode point contacts and chaotic quantum dots with single mode contacts illustrate the main strength of the scattering matrix approach: it allows for studying systems in the quantum mechanical limit, which is inaccessible for quasiclassical Green's function methods, the main theoretical tool in previous works on the triplet proximity effect.

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