Abstract Submitted
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Enhanced anti-ferromagnetic exchange between magnetic impurities in a superconducting host[1] JAY SAU, University of Maryland, College Park, NORMAN YAO, Harvard University, LEONID GLAZMAN, Yale University, EUGENE DEMLER, MIKHAIL LUKIN, Harvard University — It is generally believed that superconductivity only weakly affects the indirect exchange between magnetic impurities. If the distance r between impurities is smaller than than the superconducting coherence length ($r < \xi$), this exchange is thought to be dominated by RKKY interactions, identical to the those in a normal metallic host. This perception is based on a perturbative treatment of the exchange interaction. Here, we discuss a non-perturbative analysis and demonstrate that the presence of Yu-Shiba-Rusinov bound states induces a strong $1/r^2$ anti-ferromagnetic interaction that can dominate over conventional RKKY even at distances significantly smaller than the coherence length ($r \ll \xi$). Experimental signatures, implications and applications are discussed.

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