

Abstract Submitted
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Enhancement of T_c by impurity scattering in underdoped iron-arsenide superconductors¹ MAXIM G. VAVILOV, University of Wisconsin-Madison, Madison, WI 53706, RAFAEL M. FERNANDES, University of Minnesota, Minneapolis, MN 55455, ANDREY V. CHUBUKOV, University of Wisconsin-Madison, Madison, WI 53706 — When analyzing the effects of disorder on the superconducting transition temperature T_c of the iron pnictides, the conventional wisdom is that inter-band impurity scattering is quite harmful to the s^\pm state. In this talk, we show that this is the case only in the overdoped region of the phase diagram. In the underdoped region, impurity scattering gives rise to two opposite effects due to the competition between superconductivity and a pre-existing magnetic state. The first effect is the direct reduction of T_c due to the pair-breaking contribution coming from inter-band impurity scattering. The second effect is an indirect increase in T_c due to the suppression of long-range magnetic order by both intra-band and inter-band impurity scattering. We show that for a wide range of parameters the second effect overcomes the first, leading to an overall enhancement of T_c by disorder. Our results explain recent puzzling experimental observations on the impact of disorder on T_c of the iron pnictides, providing further evidence in favor of an s^\pm pairing state.

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