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Identifying detrimental effects for multi-band superconductivity - Application to Sr_2RuO_4[1] ALINE RAMIRES, Institute for Theoretical Sciences - ETH Zurich, MANFRED SIGRIST, Institute for Theoretical Physics - ETH Zurich — Spin polarization and anti-symmetric spin-orbit coupling are detrimental to Cooper pairing in the spin singlet and spin triplet channel, respectively. These are the well-known features of paramagnetic limiting and selection rules in non-centrosymmetric superconductors. We propose a general scheme to probe the compatibility of arbitrary pairing states with given normal state properties in model systems. This yields a universal criterion which we validate with results based on weak coupling analysis of the stability of different superconducting gaps under time-reversal and inversion symmetry breaking fields. Our criterion does, however, not address directly any aspects concerned with the pairing mechanism. A merit of the criterion is that it can be easily applied to the stability analysis of superconducting states in multi-band systems, to establish gap structures favourable within a given complex band structure. As such it can serve as a tool to identify non-trivial mechanisms to suppress superconductivity under various external influences, in particular, magnetic fields or distortions. We apply our criterion to the multi-band superconductor Sr_2RuO_4 with the aim to explore possible explanations for the limiting feature observed in the in-plane upper critical field.

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