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Numerical Challenges of a New Parametrized Description of Magnetic Josephson Junctions[1] BRENDAN CHAN, ANDREAS BILL, California State University - Long Beach — We present a study of diffusive Josephson junctions made of two superconductors connected by a ferromagnetic film. When the link is sufficiently thin Cooper pairs can tunnel from one superconductor to the other generating a Josephson current. Inhomogeneous magnetic junctions are of particular interest because they display long-range triplet pair correlations. The generation of these correlations in the hybrid structure is studied by solving numerically the Usadel equations. In previous work we have shown that the rotation of the magnetization can be used to tune the relative weight of the singlet and triplet pair correlations, thereby tuning the current. In this talk we present a novel approach to the numerical treatment of the Usadel equations, using a parametrization that takes automatically into account a required constraint of the model. We show results for the weak magnetization case. We also discuss new challenges posed in the high magnetization regime, where the parameterization is accompanied by the appearance of 'moving singularities'. Various methods are proposed in order to address this technical issue. The resolution of this problem is important to be able to include a position-dependent pair potential that will allow for the study of new phenomena.

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