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Quasicharge models of disordered Josephson Junction Arrays

Josephson junction arrays (JJAs) are engineered quantum systems exhibit macroscopic quantum effects in a highly controllable system, making them attractive systems for both fundamental research and technological applications. However, despite decades of study, there is still much that is not understood about these devices, particularly in the regimes where interactions are long-ranged, disorder is strong and charging effects are significant. I shall present some cases where disorder and interactions can lead to qualitatively different physics, and discuss theoretical progress towards understanding these complications. In particular, we shall examine the role disorder plays in the onset of transport in linear JJAs, and the effect it has on their phase diagrams.