Phases in two dimensional $p_x + ip_y$ superconducting systems with interactions beyond nearest-neighbor[1] ANTONIO RUSSO, SUDIP CHAKRAVARTY, University of California, Los Angeles — A $p_x + ip_y$ superconducting system with longer range hopping and pairing terms is considered. Chern numbers are calculated numerically, and in a simple, visual way by considering weak superconductor order parameter which is still in the same topological phase. Using nearest, second nearest, and third nearest hoppings and pairings, we find Chern numbers 0 through 4, including 3 which, unlike the other Chern numbers, must be thought of in terms of combinations of different range interactions. These Chern numbers are interpreted as phases, with different properties, in particular, the number of edge states created when a cut is introduces. We also explore the effect of introducing magentic flux (in the extreme type-II limit) through flux tubes (which are vortices in the 2D system). In particular, we look at the effect of varying distances between these vortices on the lowest excitation energies of the system.

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