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Length scales, collective modes, and type-1.5 regimes in three-band superconductors[1] JOHAN CARLSTROM, KTH Stockholm, UMass Amherst, JULIEN GARAUD, UMass Amherst, EGOR BABAEV, KTH Stockholm, UMass Amherst — The recent discovery of iron pnictide superconductors has resulted in a rapidly growing interest in multiband models with more than two bands. We derive normal modes and characteristic length scales in the conventional $U(1)$ three-band Ginzburg-Landau model as well as in its time-reversal symmetry-broken counterpart with $U(1) \times Z_2$ symmetry. We show that, in the latter case, the collective modes are associated with the mixed phase-density modes and thus are different from the Leggetts modes in two band superconductors. Next we show that gradients of densities and phase differences can be inextricably intertwined in vortex excitations in three-band models. This can lead to very long-range attractive intervortex interactions and the appearance of type-1.5 regimes even when the intercomponent Josephson coupling is large. We next show that field-induced vortices can lead to a change of broken symmetry from $U(1)$ to $U(1) \times Z_2$ in the system. In the type-1.5 regime, it results in a semi-Meissner state where the system has a macroscopic phase separation in domains with broken $U(1)$ and $U(1) \times Z_2$ symmetries.

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