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Melting of phase-stripes in Bose-Einstein condensates with synthetic spin-orbit coupling[1] ASLE SUDBO, PEDER GALTELAND, Norwegian Univ Tech (NTNU), EGOR BABAEV, Royal Institute of Technology, Stockholm, Sweden — We study a two-component, density imbalanced Bose-Einstein condensate with density-density interactions and synthetic spin-orbit coupling, focusing on the impact of thermal fluctuations and density-density interactions on spin-orbit induced effects. We find that for intermediate density imbalance and small intercomponent density-density interactions, the ground state is non-uniform, represented by a striped state of modulated phases of the individual complex order parameter components. By using mean-field stability arguments, we calculate a critical value for the intercomponent density-density interaction, above which the non-uniform ground state collapses into a uniform single-component state. This is reproduced in Monte-Carlo simulations for intermediate values of the spin-orbit coupling. We also find that the non-uniform ground state is disordered by thermal fluctuations when heated, through a Berizinskii-Kosterlitz-Thouless unbinding of disclocation pairs. We argue that, to lowest order, the spin-orbit coupling can be seen as an effective Josephson-type locking of the phase difference $\theta_1 - \theta_2$ while simultaneously allowing the system to gain energy by modulating the phase sum $\theta_1 + \theta_2$.

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