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Spin Structure and Critical Nucleation Frequency of Fractionalized Vortices in 2D Topologically Ordered Superfluids of Cold Atoms[1]
JUNLIANG SONG, FEI ZHOU, University of British Columbia — We have studied spin structures of fluctuation-driven fractionalized vortices and topological spin order in 2D nematic superfluids of cold sodium atoms. Our Monte Carlo simulations suggest a softened π-spin disclination structure in a half-quantum vortex when spin correlations are short ranged; in addition, calculations indicate that a unique non-local topological spin order emerges simultaneously as cold atoms become a superfluid below a critical temperature. We have also estimated fluctuation-dependent critical frequencies for half-quantum vortex nucleation in rotating optical traps and discussed probing these excitations in experiments.

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