Abstract Submitted
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Quantum field theory of nematic transitions in spin orbit coupled spin-1 polar bosons in one dimension JED PIXLEY, ELIO KONIG, Rutgers University — We will discuss our recent theoretical study of an ultra-cold gas of spin-1 polar bosons in one spatial dimension, which are subject to a quadratic Zeeman field and a Raman induced spin-orbit coupling. We analytically solve the model in its low-energy sector characterizing the relevant phases and the quantum phase transitions between them. Depending on the sign of the effective quadratic Zeeman field ϵ, two superfluid phases with distinct nematic order appear. In addition, we uncover a spin-liquid superfluid state at strong coupling. We employ a combination of renormalization group calculations, duality transformations, and fermionization to access the nature of phase transitions. At $\epsilon = 0$, a line of spin-charge separated pairs of Luttinger liquids divides the two nematic phases and the transition to the spin disordered state at strong coupling is of the Berezinskii-Kosterlitz-Thouless type. In contrast, at $\epsilon \neq 0$, the quantum critical theory separating nematic and strong coupling spin disordered phases maps to a quantum critical Ising model that is coupled to the charge Luttinger liquid. We will discuss the experimental signatures of our findings that are relevant to ongoing experiments in ultra-cold atomic gases of ^{23}Na.

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