

Abstract Submitted  
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**Particle-Hole Asymmetry and Brightening of Solitons in a Strongly Repulsive BEC** INDUBALA SATIJA, George Mason University, RADHA BALAKRISHNAN, Institute of Mathematical Sciences, Chennai, India, CHARLES CLARK, National Institute of Standard and Technology, Gaithersburg, Maryland — We study solitary wave propagation in the condensate of a system of hard-core bosons with nearest-neighbor interactions. For this strongly repulsive system, the evolution equation for the condensate order parameter of the system, obtained using spin coherent state averages is different from the usual Gross-Pitaevskii equation (GPE). The system is found to support two kinds of solitons when there is a particle-hole imbalance: a dark soliton that dies out as the velocity approaches the sound velocity, and a new type of soliton which brightens and persists all the way up to the sound velocity, transforming into a periodic wave train at supersonic speed. Analogous to the GPE soliton, the energy-momentum dispersion for both solitons is characterized by Lieb II modes.

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