

Abstract Submitted
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Ultracold bosons in the presence of a second species in the Tonks-Girardeau regime: dynamics and quantum features¹ MIGUEL ANGEL GARCIA-MARCH, THOMAS FOGARTY, THOMAS BUSCH, Department of Physics, University College Cork — We develop a framework to study the interaction between two ultracold bosonic species in different regimes. One species is in the low correlation limit forming a Bose-Einstein condensate (BEC), while the other is in the strongly correlated Tonks-Girardeau regime. We use a Bose-Hubbard-like model where, due to the momentum distribution of the Tonks gas, many single particle states are considered and study the dynamics of the system by numerical simulation of the equations obtained. The atoms in the Tonks gas act as impurities submerged in the BEC, and the excitations created by their interactions with the BEC gas can be understood in terms of polarons. We focus on the fundamental quantum properties of the system and investigate the effects the condensed environment has on the Tonks-Girardeau gas as a function of the interspecies scattering strength.

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