

Abstract Submitted  
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**Consistent Hartree-Fock-Bogoliubov approach to the Frohlich Polaron Problem**<sup>1</sup> HONG LING, Department of Physics and Astronomy, Rowan University, Glassboro, New Jersey 08028 USA, BEN KAIN, <sup>1</sup>Department of Physics, College of the Holy Cross, Worcester, Massachusetts 01610 USA — We apply the Lee-Low-Pine (LLP) transformation to change the Frohlich model which describes a mobile impurity coupled to noninteracting phonons to an interacting many-phonon system free of impurities. We adapt the generalized Hartree-Fock-Bogoliubov (HFB) method to this impurity-free interacting many-phonon system. We specialize our general HFB description of the Frohlich polaron to Bose polarons in quasi-1D cold atom mixtures. The LLP transformed many-phonon system distinguishes itself with an artificial phonon-phonon interaction which is very different from the usual two-body interaction. We use the quasi-one-dimensional model, which is free of an ultraviolet divergence that exists in higher dimensions, to better understand how this unique interaction affects polaron states and how the density and pair correlations inherent to the HFB method conspire to create a polaron ground state with an energy in good agreement with and far closer to the prediction from Feynman's variational path integral approach than mean-field theory where HFB correlations are absent.

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