Abstract Submitted
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Dynamics of impurities in ultracold Bose gas YULIA SHCHADILOVA[1], Russian Quantum Center, FABIAN GRUSDT[2], Department of Physics and Research Center OPTIMAS, University of Kaiserslautern, ALEXEY RUBTSOV[3], Russian Quantum Center, EUGENE DEMLER, Department of Physics, Harvard University — A system of an impurity immersed in a Bose-Einstein condensate (BEC) exhibits the polaronic effect, which is known to be an ubiquitous phenomenon in a wide range of physical systems including semiconductors, doped Mott insulators, and high-Tc superconductors. Recent analysis of the BEC-polaron problem showed that existing analytical approaches do not provide reliable results in the experimentally relevant range of parameters when tested against Monte Carlo (MC) simulations [1]. In this contribution we demonstrate that the description of polarons at finite momentum can be done by employing an analytical class of wavefunctions based on the correlated Gaussian ansatz (CGWs) [2]. We show that CGWs show excellent agreement with known MC results for the polaron binding energy for a wide range of interactions. We discuss the properties of the polarons and atomic mixtures in systems of ultracold atoms in which polaronic effects can be observed with current experimental technology. Our CGWs predicts a specific pattern of correlations between host atoms that can be measured in time-of-flight experiments. [1] J. Vlietinck, et al arXiv:1406.6506; [2] Y. Shchadilova, et al arXiv:1410.5691; [3] F. Grusdt, et al arXiv:1410.2203

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