

Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

Solution of the Fröhlich polaron problem at intermediate couplings FABIAN GRUSDT, University of Kaiserslautern and Graduate School Material Science in MAINZ and Department of Physics, Harvard University, YULIA E. SHCHADILOVA, Russian Quantum Center, Skolkovo and Department of Physics, Harvard University, ALEXEY N. RUBTSOV, Department of Physics, Moscow State University and Russian Quantum Center, Skolkovo, EUGENE DEMLER, Department of Physics, Harvard University — We develop a renormalization group approach for analyzing Fröhlich polarons and apply it to a problem of impurity atoms immersed in a Bose-Einstein condensate (BEC) of ultra cold atoms. Polaron energies obtained by our method are in excellent agreement with recent diagrammatic Monte Carlo calculations [1] for a wide range of interaction strengths. We show analytically that the energy of the Fröhlich polaron in a BEC is logarithmically UV divergent, and present a regularization scheme. This allows us to make predictions for the polaron energy, which can be tested in future experiments. Furthermore we calculate the effective mass of polarons and find a smooth crossover from weak to strong coupling regimes. Our method can be generalized to non-equilibrium polaron problems.

- [1] Vlietinck et al., arXiv:1406.6506
- [2] Grusdt et al., arXiv:1410.2203
- [3] Shchadilova et al., arXiv:1410.5691

Fabian Grusdt
University of Kaiserslautern, Graduate School Material Science
in MAINZ, Harvard University

Date submitted: 30 Jan 2015

Electronic form version 1.4