

Abstract Submitted
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Dense quantum plasmas - failures of quantum hydrodynamic models MICHAEL BONITZ, ECKHARD PEHLKE, TIM SCHOOF, Institute for Theoretical Physics and Astrophysics, Kiel University — Dense quantum plasmas have been successfully described in recent decades using a variety of methods such as quantum statistics, quantum kinetic theory and first principle simulations [1]. The high theoretical effort has stimulated attempts for a simplified description where a particular popularity has received quantum hydrodynamics (QHD) [2]. However, very often the limitations of QHD are ignored, giving rise to numerous predictions that are in contrast to basic quantum many-body theory. A recent striking example are the predictions of an attractive proton-proton potential in dense hydrogen and [3]. We will discuss the reason for this failure of QHD [4] and draw conclusions for the applicability of this approach.

[1] M. Bonitz, “Quantum Kinetic Theory,” Teubner, Stuttgart, Leipzig 1998

[2] G. Manfredi, and F. Haas, Phys. Rev. B **64**, 075316 (2001).

[3] P.K. Shukla, and B. Eliasson, Phys. Rev. Lett. **108**, 165007(2012).

[4] M. Bonitz, E. Pehlke, and T. Schoof, Phys. Rev. E **87**, 033105 (2013).

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