**The role of the interaction range in ultracold Fermi-gases**

**and the prospect of determining it**

N. Kaschewski1, A. Pelster1 and C. Sa de Melo2

*1Physics Department and Research Center OPTIMAS, RPTU Kaiserslautern-Landau, Germany*

*2School of Physics, Georgia Institure of Technology, Atlanta, USA*

e-mail: axel.pelster@rptu.de

In cold atomic gases the microscopic details of the interaction potential are mainly thought to be irrelevant as the range of the interaction is at least one order of magnitude lower than the typical inter-particle spacing. Therefore in degenerate Bose and Fermi gases of neutral atoms, the interactions are always modelled as a contact interaction potential and the general properties besides the scattering lengths are lost. In other fields as, for instance in nuclear physics, the shape of the interaction potential is believed to play a larger role due to the higher densities [1]. So far there are no known methods to directly probe the properties of the interatomic interactions in the same spirit as in nuclear physics.

In this poster we present a formalism that includes leading order effects of the finite interaction range of atomic interactions by generalizing Bethe’s theory of nuclear scattering [2] to ultracold atomic gases. We show by the example of a BCS type Fermi-gas at low temperatures that the influence of the interaction range represents a small correction to the established zero-range theory, but nevertheless has a non-neglectable effect on the correlation functions as well as on response functions of the gas. Those can be influenced strongly by the interaction range and open the possibility to a direct measurement of the effective range parameter for dilute atomic gases.

REFERENCES

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