

清华大学高等研究院

Institute for Advanced Study, Tsinghua University

Mini lectures:

Few-body physics from the functional renormalization group

Speaker:Dr. Richard Schmidt
ITAMP, Harvard UniversityTime:2:00pm Thursday, Oct 30, 2014
10:00am Friday, Oct 31, 2014

Venue: Conference Hall 322, Science Building, Tsinghua University Abstract

In this very informal "lecture" I will introduce the exact functional renormalization group equation derived by Wetterich [1]. Then I will show in great detail how this equation is applied to practical calculations using the simple example of two-body scattering via contact interactions. This example will allow us also to derive the beta-function governing the phase diagram of the unitary Fermi gas. Following that we will proceed to the three-body problem of bosons interacting via short-range interactions. For a simple truncation of the effective action will go through the calculation leading to the famous RG limit cycle flow signaling Efimov physics with scale invariance broken to leave only a discrete scale invariance intact.

Ref.:

[1] C. Wetterich, Exact evolution equation for the effective potential, Physics Letters B 301, 90 (1993).

[2] R. Schmidt, From few- to many-body physics with ultracold atoms, PhD Thesis, TU Munich (2013).

[3] For a review see: S. Floerchinger, S. Moroz, and R. Schmidt, Efimov Physics from the Functional Renormalization Group, Few-body Syst. 51, 153 (2011).

Related references:

[4] S. Moroz, S. Floerchinger, R. Schmidt and C. Wetterich, Efimov effect from functional renormalization, Phys. Rev. A 79, 042705 (2009).

[5] S. Floerchinger, R. Schmidt, S. Moroz and C. Wetterich, Functional renormalization for trion formation in ultracold fermion gases, Phys. Rev. A 79, 013603 (2009).

[6] S. Floerchinger, R. Schmidt and C. Wetterich, Three-body loss in lithium from functional renormalization, Phys. Rev. A 79, 053633 (2009).

[7] S. Moroz, and R. Schmidt, Nonrelativistic inverse square potential, scale anomaly, and complex extension, Ann. Phys. 325, 491 (2010).

[8] R. Schmidt, and S. Moroz, Renormalization-group study of the four-body problem, Phys. Rev. A 81, 052709 (2010).

[9] R. Schmidt, S. P. Rath, and W. Zwerger, Efimov physics beyond universality, Eur. Phys. J. B 85, 386 (2012)