Physikalisches Institut
Fakultät für Mathematik und Physik
Albert-Ludwigs-Universität Freiburg

IRTG-Seminar

Rockson Chang
Laboratoire Charles Fabry, Institut d'Optique Graduate School, Palaiseau (France)

"A 3D momentum-space microscope for ultracold lattice gases: Probing microscopic correlations from quantum depletion"

Among the growing pantheon of particles cooled to ultracold temperatures, metastable Helium occupies a special place due to its many unique properties. Notably, the large internal energy of the metastable 23S1 state allows for single atom detection and has led to the direct observation of fundamentally quantum effects such as bunching and anti-bunching of bosons and fermions [1]. In this talk I will present a new apparatus for the study of many-body states of ultracold Helium in an optical lattice [2, 3], where the single-particle detection coupled with the light Helium mass and long 330 ms time-of-flight results in a system capable of reconstructing 3D momentum distributions at high-resolution. In particular, I will present our recent work on the first demonstration of pure Doppler laser cooling in 3D [4], and our progress towards the study of the microscopic signatures of quantum depletion of a Bose-Einstein condensate of Helium-4.

[1] T. Jeltes et al., Nature 445, 402-405 (2007)
[2] Q. Bouton et al., Phys. Rev. A 91, 061402(R) (2015)
[3] F. Nogrette et al., arXiv:1507.03816 (in press)
[4] R. Chang et al., Phys. Rev. A 90, 063407 (2014)

Tuesday, December 1, 2015, 4:00 p.m., HS II, Physik-Hochhaus, Hermann-Herder-Str. 3

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Albert-Ludwigs-Universität Freiburg

Contact: Christiane Füldner
IRTG / Cold Controlled Ensembles in Physics and Chemistry
Phone +49 761 203 97666
E-mail : christiane.fueldner@physik.uni-freiburg.de