复旦大学物理系物质科学报告

Physics Department Colloquium

Quantum-Gas Microscopes -- Quantum-Simulation with Single-Particle Access

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Abstract: The possibility to trap atoms in well-controlled engineered environments in optical lattices has proved to be a powerful tool for quantum-simulation of strongly correlated quantum systems. The great challenge to obtain full single-site resolution and single-atom control in optical lattices was overcome by the development of quantum-gas microscopes [1] and I will present an overview of the recent developments in this field [2]. Fluorescence imaging of atoms has made it possible to directly observe bosonic and fermionic many-body quantum systems with single-atom resolution in an unprecedented way, giving access to, e.g., in-situ measurements of temperature and entropy distributions, direct observation of correlations and their spreading, or the build-up of entanglement. I will also present how we achieved single-atom-resolved fluorescence imaging of fermionic potassium-40 atoms using electromagnetically-induced-transparency (EIT) cooling [3], and a new way of Raman gray-molasses cooling on the D2-line [4], and report on our progress towards the study of strongly correlated fermionic quantum systems and their out-of-equilibrium dynamics.

References

[1] W. Bakr et al., Nature 462, 74 (2009); J. Sherson et al., Nature 467, 68 (2010).
[2] S. Kuhr, Natl. Sci. Rev. 3, 170 (2016).
[3] E. Haller et al., Nature Physics 11, 738 (2015).
[4] G. Bruce et al., J. Phys. B: At. Mol. Opt. Phys. 50, 095002 (2017).

Time：2:00pm, Thursday, June 29, 2017
Location：Physics Building, Room 403
(Cookies and coffee are served from 1:30 pm)