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Exploring the physics of disorder with Bose-Einstein condensates

The combination of disorder and nonlinearities determines the transport properties of many physical systems, including normal conductors and superconductors, biological systems, or light in disordered nonlinear media. While a full understanding of the interplay of disorder and nonlinearities has long been sought, the lack of complete control over experimental parameters in most systems makes systematic investigations difficult, and there are still several open questions. I will describe how in recent experiments we have employed Bose-Einstein condensates with tunable interactions in combination with optical potentials to address some of the open questions, related for example to the transport properties and to the transition from insulating to superfluid phases.

28. Januar 2011, 14:00 Uhr

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