



Physics Colloquium

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An exact solution for the two-body problem of interacting ultra-cold atoms in arbitrary dimensions

We consider two charge neutral, ultra-cold atoms interacting through a short-range potential and confined in a spherically symmetric harmonic oscillator trap. The problem is exactly solvable in arbitrary dimensions, and for $d=1,2,3$ is relevant to recent experimental work on trapped, ultra-cold atoms. We show that the energy spectrum of the system is universal in all dimensions, irrespective of the shape of the interaction potential, provided its range is much smaller than the oscillator length.

We also provide a simple approach to constructing the appropriate zero-range pseudo-potential in arbitrary dimensions without having to invoke the additional mathematical formalism of self-adjoint extensions and renormalization theory.