Higher Order Correlations in Quantum Gases

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One of the seminal advances in quantum optics was the understanding that a quantised description of ensembles of photons is best characterised by correlation functions. Correlations are also a fundamental property of matter waves, and the single wavefunction that describes a Bose-Einstein condensate (BEC) is in principle characterised by long range coherence to all orders (i.e. a universal correlation value of unity). Here we use higher order correlations to probe the coherence, and long range order, of quantum gases.

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