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【6】 The Einstein-Podolsky-Rosen paradox in a many-body system

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Quantum mechanics gives a bound on how precisely two non-commuting observables can be predicted, as expressed by the Heisenberg uncertainty principle. Nevertheless, Einstein, Podolsky and Rosen (EPR) realised that there are situations in which measurements on one system allow to predict measurement results on another system with certainty, seemingly violating the uncertainty relation.

By performing experiments with ultracold atomic ensembles, we have been able to observe for the first time this EPR “paradox” between two many-body systems. Apart from their fundamental interest, our investigations could find application in quantum metrology, for example to sense gradients.

During this presentation, our studies on entanglement and Bell correlations will also be mentioned.

Authors: Dr FADEL, Matteo (Departement Physik, Universität Basel); Dr ZIBOLD, Tilman (Universität Basel); Dr DÉCAMPS, Boris Clément (University of Basel); Prof. TREUTLEIN, Philipp (University of Basel)

Presenter: Dr FADEL, Matteo (Departement Physik, Universität Basel)

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