



Monday, 13 April 2026

Lecture Hall N24/H13, at 16:15

Coffee and cookies will be served in front of the lecture hall from 16:00

**Einstein-Podolsky-Rosen experiment with two
Bose-Einstein condensates**

Prof. Dr. Philipp Treutlein

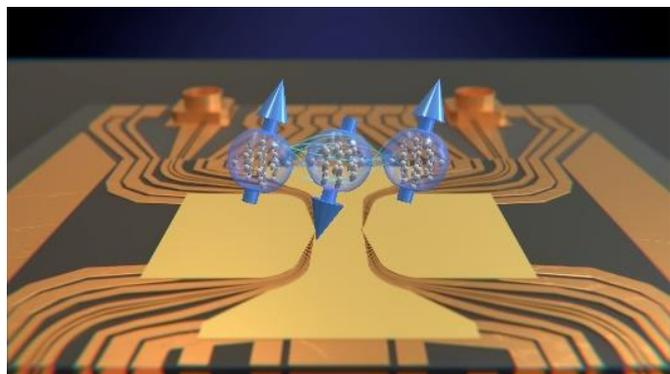
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 <https://atom.physik.unibas.ch>



In 1935, Einstein, Podolsky, and Rosen (EPR) conceived a Gedankenexperiment, that has become a cornerstone of quantum physics and continues to challenge our understanding of reality and locality. While the EPR paradox has been demonstrated with small quantum systems, its realization with massive many-particle systems remains a key challenge, as such systems are closely linked to local realism in our everyday experience and may serve as probes of the quantum-to-classical transition.

I will report an EPR experiment with two spatially separated Bose-Einstein condensates, each containing about 700 rubidium atoms [1]. Entanglement between the condensates results in strong correlations of their collective spins, enabling the first observation of the EPR paradox with spatially separated, massive many-particle systems. Our results show that the conflict between quantum mechanics and local realism persists even for systems comprising more than a thousand massive particles. From a technological perspective, our system constitutes an array of entangled atomic sensors that allows us to implement novel protocols for multiparameter quantum metrology [2].



[1] P. Colciaghi et al., Phys. Rev. X 13, 021031 (2023).

[2] Y. Li et al., Science 391, 374 (2026).