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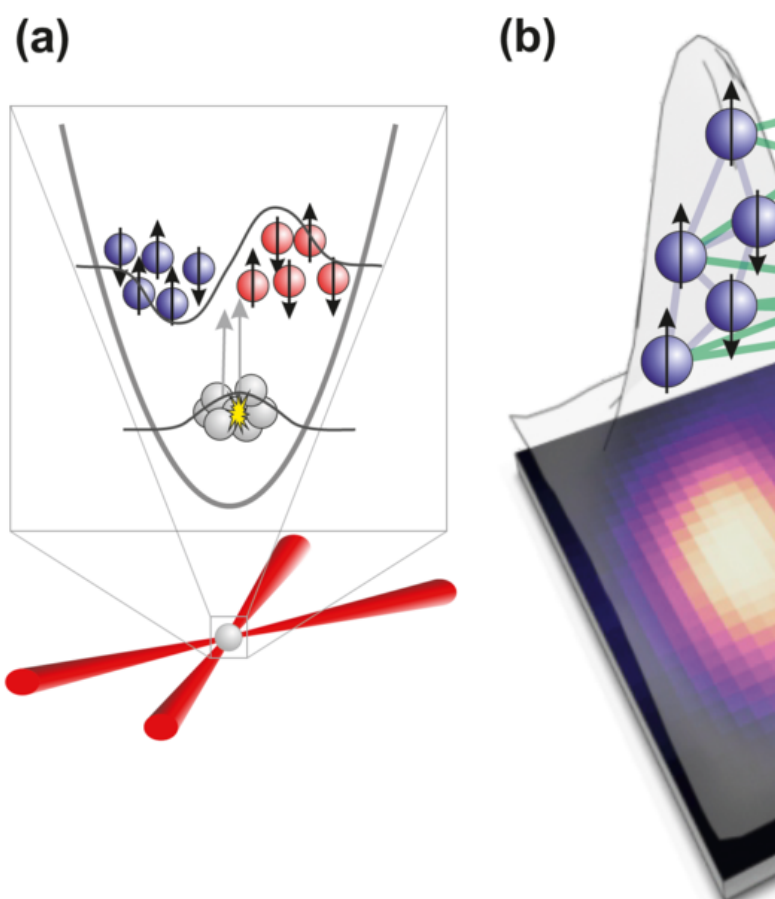
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05/22/2018

# QUANTUM ENTANGLEMENT BETWEEN THE TWO CLOUDS STARTING FROM A SINGLE BOSE-EINSTEIN CONDENSATE

Dr. Giuseppe Vitagliano from the Institute for Quantum Information (IQOQI-Vienna) collaborated with the Quantum Metrology group led by Prof. Geza Toth at the University of Innsbruck, Austria, on detecting entanglement in Bose-Einstein condensates.



Pictorial representation of the experiment: entanglement is achieved between the two clouds of atoms starting from a single Bose-Einstein condensate. Drawing by: Iagoba Apellaniz, UPV/EHU

The scheme has been used in the experiment of Prof. Carolin Fahlbrunn at the Leibniz University Hannover, where an entangled state between two spatially separated Bose-Einstein condensates has been observed. The results have been published in Science [350, 416-418 (2018)] (<http://science.sciencemag.org/content/350/6261/416>)

In the experiment, a highly entangled Dicke state was created. The cloud was placed in a double-well and thus spatially separated. Measurements of the collective spin on the two wells show that thousands of atoms each, are entangled.

The experiment demonstrates that multipartite entanglement of particles can be converted into bipartite entanglement of two particles. This is very relevant, since there are numerous experimental schemes to create entangled states in Bose-Einstein condensates, while for certain applications technologies the distinguishability of the parties is required.



## CONTACT

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