

Entanglement between two spatially separated BECs

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We explore the generation of entanglement between the collective spin states of two independent, spatially separated Bose-Einstein condensates. In particular, we investigate different entanglement schemes that rely on collisions in a state-dependent double well potential on an atom chip [1]. One such scheme starts by creating two independent BECs by evaporative cooling in a static magnetic double well potential. Each BEC is prepared in a superposition of two hyperfine states, realizing a collective spin, which can be individually addressed and manipulated with microwave and radio-frequency near-fields. Entanglement is generated by state-dependent collisions between the BECs, which are induced in a controlled way with an on-chip microwave potential. We report on the progress towards an experimental implementation.

Keywords : entanglement , atom chip

Reference:

[1] H. Kurkjian, K. Pawłowski, A. Sinatra, and P. Treutlein, Spin squeezing and Einstein-Podolsky-Rosen entanglement of two bimodal condensates in state-dependent potentials, *Physical Review A*, 88, 043605 (2013).