

Entanglement generation between spinor Bose-Einstein condensates using Rydberg excitations

Thu, 2016-03-10 16:57 - [shimon_machluf](#) [1] **Date:** 2016-02-12

Author(s):

Sandrine Idlas, Luis Domenzain, Robert Spreeuw, and Tim Byrnes

Reference:

Phys. Rev. A 93, 022319

URL:

<http://journals.aps.org/prabstract/10.1103/PhysRevA.93.022319> [2]

We propose an experimental scheme of generating entangled states between two spinor Bose-Einstein condensates (BECs) using Rydberg excitations. Due to the strong interaction between Rydberg atoms, the Rydberg excitation creates an interaction between two closely located BECs. The method is suitable particularly for atom chip and permanent magnetic trap systems, which can create many BECs with an arbitrary two-dimensional geometry. We show two schemes of entangled state generation, based on stimulated Raman adiabatic passage (STIRAP) methods. The first method produces a symmetric state with total S_x spin zero between ground and excited states of the atoms using a single STIRAP pair, while the second produces a NOON state between hyperfine ground states using two STIRAP pairs. We show that despite the additional complexity of the BECs, it is possible to identify the initial and final adiabatic states exactly. We verify our theoretical predictions using numerical simulations on small boson number systems.

- [04.10.+s Entanglement in spin models/oscillator chains](#) [3]
- [RySO](#) [4]
- [Result](#) [5]
- [04.80.+d Entanglement dynamics in composite quantum systems](#) [6]
- [15.10.Ry Rydberg atoms](#) [7]

Source URL:

<http://qurope.eu/db/publications/entanglement-generation-between-spinor-bose-einstein-condensates-using-rydberg-excit>

Links:

[1] <http://qurope.eu/users/shimimachluf>

[2] <http://journals.aps.org/prabstract/10.1103/PhysRevA.93.022319>

[3] <http://qurope.eu/category/qics/00-quantum-information-science/04-entanglement-many-body-systems/0410s-entanglement-sp>

[4] <http://qurope.eu/category/projects/rysq>

[5] <http://qurope.eu/category/attribute/result>

[6] <http://qurope.eu/category/qics/00-quantum-information-science/04-entanglement-many-body-systems/0480d-entanglement-dy>

[7] <http://qurope.eu/category/qics/10-quantum-computation/15-implementations-quantum-optics/1510ry-rydberg-atoms>