一般セッション(口頭講演) | 4 JSAP-OSA Joint Symposia 2021 | 4.7 Quantum Optics and Nonlinear Optics

[11a-N307-1~9]4.7 Quantum Optics and Nonlinear Optics

平野 琢也(学習院大)、衛藤 雄二郎(京大)

2021年9月11日(土) 09:00 ～ 12:15 N307 (口頭)

△：奨励賞エントリー

▲：英語発表

▼：奨励賞エントリーかつ英語発表

空欄：どちらもなし

09:30 ～ 10:00

▲[11a-N307-2]Adiabatic quantum computing with Bose-Einstein condensates

Naeimeh Mohseni[2]、Marek Narozniak[1]、Alexey Pyrkov[3]、Valentin Ivannikov[1]、Jonathan Dowling[4]、○Tim Byrnes[1] (1.NYU Shanghai、2.Max Planck Insitute、3.RAS、4.LSU)

キーワード：Bose-Einstein condensates, Adiabatic quantum computing

Traditionally quantum computing approaches have been formulated in terms of either discrete (qubit) or continuous variables. Our approach offers an alternative third path, naturally suited towards implementations in cold atom ensembles and BECs. In the standard approach to adiabatic quantum computing (AQC), quantum information stored on qubits are adiabatically evolved to find the lowest energy state of a problem Hamiltonian. Here we investigate a variation of AQC where spin ensembles are used in place of qubits. The use of ensembles duplicates the quantum information, and allows errors to be suppressed during the adiabatic evolution. For large ensemble sizes, we find that the minimum gap for large ensembles is well predicted by mean-field theory and the AQC performance can be shown to improve with ensemble size, realizing error-suppression. While there are problem instances where the minimal gap can decrease, the number of these instances is suppressed for large ensemble sizes. Our approach shows that it is possible to perform AQC without the necessity of controlling individual qubits, which allows for an alternative route towards implementing AQC.