Journal of Quality Measurement and Analysis *JQMA* 20(2) 2024, 111-125
e-ISSN: 2600-8602 *http://www.ukm.my/jqma*
https://doi.org/10.17576/jqma.2002.2024.09

COMPACTONS IN INTERSPECIES SPIN–ORBIT-COUPLED NONLINEAR SCHRÖDINGER LATTICES UNDER STRONG NONLINEARITY MANAGEMENT

(Kompakton dalam Kekisi Schrödinger Tak Linear yang Terganding Spin-Orbit Antaraspesis di Bawah Pengurusan Kuat Ketaklelurusan)

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ABSTRACT

This study shows the existence of special matter waves, known as compactons, in binary discrete nonlinear Schrödinger (DNLS) equations with equal distributions of interspecies Rashba and Dresselhaus spin-orbit coupling (SOC) in the presence of fast periodic time modulations of the interspecies scattering length. However, the existence is limited to only of one-site compacton type, which means the absence of larger size compactons such as the two- and three-site. Further, the dynamical stability of the compactons is predicted by using linear stability analysis method and verified through the direct numerical integrations of the equations. We find that the stability of the compactons has strong dependence on the strength of SOC term.

Keywords: discrete nonlinear Schrödinger equation, spin-orbit coupling, compactons, nonlinearity management

ABSTRAK

Kajian ini menunjukkan kewujudan gelombang jirim khas, yang dikenali sebagai kompakton, dalam persamaan dedua Schrödinger diskret tak linear bersama caruman sama gandingan spin-orbit Rashba dan Dresselhaus antaraspesis dengan kehadiran pemodulatan masa berkala pantas pada panjang serakan atom antara spesis. Namun, kewujudannya terhad kepada kompakton jenis bertapak satu, yang menunjukkan ketiadaan kompakton bersaiz besar seperti tapak dua dan tiga. Selanjutnya, kestabilan dinamik kompakton diramal menggunakan analisis kestabilan linear dan disahkan menerusi penyepaduan berangka langsung pada persamaan tersebut. Kami mendapati bahawa kestabilan kompakton amat bergantung dengan kekuatan sebutan gandingan spin-orbit.

Kata kunci: persamaan Schrödinger diskret tak linear, gandingan spin-orbit, kompakton, pengurusan ketaklelurusan

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Received: 15 September 2023
Accepted: 7 Mac 2024

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