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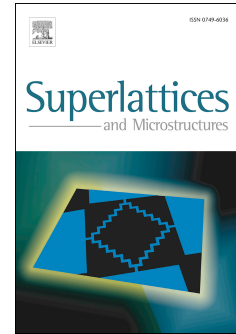
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# Rogue waves for a discrete (2+1)-dimensional Ablowitz-Ladik equation in the nonlinear optics and Bose-Einstein condensation

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## Abstract

Under investigation in this paper is a discrete (2+1)-dimensional Ablowitz-Ladik equation, which is used to model the nonlinear waves in the nonlinear optics and Bose-Einstein condensation. Employing the Kadomtsev-Petviashvili hierarchy reduction, we obtain the rogue wave solutions in terms of the Gramian. We graphically study the first-, second- and third-order rogue waves with the influence of the focusing coefficient and coupling strength. When the value of the focusing coefficient increases, both the peak of the rogue wave and background decrease. When the value of the coupling strength increases, the rogue wave raises and decays in a shorter time. High-order rogue waves are exhibited as one single highest peak and some lower humps, and such lower humps are shown as the triangular and circular patterns.

*Keywords:* Nonlinear optics; Bose-Einstein condensation; Discrete (2+1)-dimensional Ablowitz-Ladik equation; Kadomtsev-Petviashvili hierarchy reduction; Rogue waves

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