

Directional flow of solitons with asymmetric potential wells: Soliton diode

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Abstract:

We study the flow of bright solitons through two asymmetric potential wells. The scattering of a soliton by certain type of single potential wells, e.g., Gaussian or Rosen-Morse, is distinguished by a critical velocity above which solitons can transmit almost completely and below which solitons can reflect nearly perfectly. For two such wells in series with certain parameter combinations, we find that there is an appreciable velocity range for which solitons can propagate in one direction only. Our study shows that this directional propagation or diode behavior is due to a combined effect of the sharp transition in the transport coefficients at the critical velocity and a slight reduction in the center-of-mass speed of the soliton while it travels across a potential well.

References:

1. M. Asad-uz-zaman and U. Al Khawaja, EPL, **101** (2013) 50008.