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Investigating the King Fermion interaction in the double sine Gordon potential

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Abstract

In this research, we considered, including double sine-Gordon potential, along with a unique Lagrangian with terms related to bosonic and fermionic fields. When a bosonic wave collides with a fermionic particle, the effects are analyzed and investigated. The important point in this research is that the potential considered is double sine-Gordon potential, which, though complex, is used for the first time in the interaction with fermions. In this research, the parameters ε , λ , η and β play a very key role in the calculations. Parameter ε is the coefficient of the terms of the double sine-Gordon potential, λ is the Yukawa coupling coefficient and parameters η and β are the bosonic wave coefficients. In addition to these two variables, the important parameter v_i (the collision speed of bosonic particles with fermionic particles in the relativistic state) is also considered. Important calculations have been performed by changing the numerical values of the parameters ε , λ , v_i , η and β . In these calculations, in addition to the integer value for the parameter ε , half-integer values are also considered for this parameter. Another important aspect of this research is the study of how bosons interact with fermions and the creation of oscillons and bions. An attempt has been made to perform calculations in three-dimensional form so that fundamental particles and the interaction between them can be understood better and more accurately.

Keywords: kink, antikink, boson, bion, fermion, oscillon, fermionic field, Dirac field

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