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Bound state solutions of the Manning–Rosen potential

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Abstract:

Using the asymptotic iteration method (AIM), we have obtained analytical approximations to the ℓ-wave solutions of the Schrödinger equation with the Manning–Rosen potential. The energy eigenvalues equation and the corresponding wavefunctions have been obtained explicitly. Three different Pekeris-type approximation schemes have been used to deal with thecentrifugal term. To show the accuracy of our results, we have calculated the eigenvalues numerically for arbitrary quantumnumbers *n* and ℓ for some diatomic molecules (HCl, CH, LiH, and CO). It is found that the results are in good agreement with other results found in the literature. A straightforward extension to the s-wave case and Hulthén potential case are also presented.

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