Thermal Properties and Quantum Information Theory with the Shifted Morse Potential

Etiufan Udoh[1], Precious Amadi [2], Uduakobong Okorie[3], Akaninyene Antia[1], Lewis Obagboye[4], Ridha Horchani[5], Nidhal Sulaiman[5], and Akpan Ikot[6]

[1]University of Uyo
[2]University of Port Harcourt
[3]Akwa Ibom State University
[4]National Mathematical Centre
[5]Sultan Qaboos University
[6]Theoretical Physics Group

March 7, 2022

Abstract

By employing the Nikiforov-Uvarov functional analysis (NUFA) method, we solved the radial Schrodinger equation with the shifted Morse potential model. The analytical expressions of the energy eigenvalues, eigenfunctions and numerical results were determined for selected values of the potential parameters. Variations of different thermodynamic functions with temperature were discussed extensively. Different quantum information theories including Shannon entropy, Fisher information and Fisher-Shannon product of the shifted Morse potential were investigated numerically and graphically in position and momentum spaces for ground and first excited states. The quantum information theories considered satisfied their corresponding inequalities including Bialynicki–Birula–Mycielski, Stam–Cramer–Rao inequalities and the Fisher–Shannon product relation.

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