

Mukherjee, Neetik; Roy, Amlan K.

Some complexity measures in confined isotropic harmonic oscillator. (English) Zbl 1433.82004
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Summary: Various well-known statistical measures like López-Ruiz, Mancini, Calbet (LMC) and Fisher-Shannon complexity have been explored for confined isotropic harmonic oscillator (CHO) in composite position (r) and momentum (p) spaces. To get a deeper insight about CHO, a more generalized form of these quantities with Rényi entropy (R) is invoked here. The importance of scaling parameter in the exponential part is also investigated. R is estimated considering order of entropic moments α, β as $(\frac{2}{3}, 3)$ in r and p spaces respectively. Explicit results of these measures with respect to variation of confinement radius r_c is provided systematically for first eight energy states, namely, $1s, 1p, 1d, 2s, 1f, 2p, 1g$ and $2d$. This investigation advocates that (i) CHO may be treated as a missing-link between PISB and IHO (ii) an increase in number of nodes takes the system towards order. A detailed analysis of these complexity measures reveals several other hitherto unreported interesting features.

MSC:

82B10 Quantum equilibrium statistical mechanics (general)

Keywords:

LMC complexity; Fisher-Shannon complexity; Rényi entropy; Shannon entropy; confined isotropic harmonic oscillator

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