

Information Theory of D -dimensional Harmonic Systems. Application to Rydberg and Pseudoclassical States

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The spreading properties of the quantum probability distribution of the ground and excited states of the D -dimensional harmonic system (i.e., a particle moving under the action of a quadratic potential) are examined by means of dispersion (variance, moments around the origin, logarithmic moments), entropic (Shannon and Rényi entropies, Fisher information) and complexity (Crámer-Rao, Fisher-Shannon and LMC) measures. This is done in a fully analytical manner in terms of the dimensionality D and the radial and angular hyperquantum numbers characterizing the states. Emphasis is made for the Rydberg states (i.e., states with very high radial hyperquantum number for fixed D) and the quasiclassical states (i.e., states with fixed hyperquantum numbers for high-dimensional D), where the numerical computation is most difficult to be performed. Novel analytical results for these states and about the measures of complexity of arbitrary states are given.

[1] I. V. Toranzo and J. S. Dehesa, Information theory of the D -dimensional harmonic systems. Application to Rydberg and quasiclassical states. *Preprint in preparation*.

[2] J. S. Dehesa, I. V. Toranzo and D. Puertas-Centeno, *Int. J. Quantum Chem.* **117**, 48-56 (2017).

[3] D. Puertas-Centeno, I. V. Toranzo and J. S. Dehesa, *Entropy* 2017, 19, 164. .