Entropic uncertainty measures of the D-dimensional hydrogenic system in the Rydberg and pseudoclassical limits

D. Puertas-Centeno[1,2], I. V. Toranzo[1,2] and J. S. Dehesa[1,2]

(1) Departamento de Física Atómica, Molecular y Nuclear, Universidad de Granada, Granada 18071, Spain
(2) Instituto Carlos I de Física Teórica y Computacional, Universidad de Granada, Granada 18071, Spain
vidda@correo.ugr.es

An informational-theoretical analysis of the quantum probability distribution of the D-dimensional hydrogenic system is done in a fully analytical manner 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. The results are expressed in terms of the dimensionality D, the nuclear charge Z and the radial and angular hyperquantum numbers characterizing the states. Emphasis is made for the pseudoclassical states (i.e., states with fixed hyperquantum numbers for high-dimensional D) and the Rydberg states (i.e., states with very high radial hyperquantum number for fixed D), where the numerical computation is most difficult to be performed. Novel analytical results for these states are given and discussed.

[1] **D. Puertas-Centeno**, N.M. Temme, I. V. Toranzo and J.S. Dehesa. *Entropic uncertainty measures for large dimensional hydrogenic systems.*J. Math. Phys. (submitted)

[2] I. V. Toranzo, **D. Puertas-Centeno** and J. S. Dehesa.*Entropic properties of D-dimensional Rydberg systems.* Physica A 462 (2016) 11971206.

[3] J. S. Dehesa, S. López-Rosa, A. Martnez-Finkelshtein, and R.J. Yáñez, *Information theory of D-dimensional hydrogenic systems: Application to circular and Rydberg states*, Int. J. Quantum Chem. 110 (2010) 1529.