

López-Rosa, S.; Toranzo, I. V.; Sánchez-Moreno, P.; Dehesa, J. S.

Response to “Comment on “Entropy and complexity analysis of hydrogenic Rydberg atoms”
[J. Math. Phys. 58, 104101 (2017)]. (English) [Zbl 1373.81115](#)
J. Math. Phys. 58, No. 10, 104102, 2 p. (2017).

From the text: In their comment [J. Math. Phys. 58, No. 10, 104101, 4 p. (2017; [Zbl 1373.81110](#))] on our paper [*S. López-Rosa et al.*, J. Math. Phys. 54, No. 5, 052109, 18 p. (2013; [Zbl 1282.81054](#))], *L. G. Jiao* and *L. R. Zan* argued that the expressions used for the Crámer-Rao complexity in both position and momentum spaces are incorrect due to the wrong definition of variance. Specifically they point out that: (1) the correct form of this complexity in position space is presented exactly in their work; (2) in momentum space, two different definitions of the variance are provided and corresponding Crámer-Rao complexities are discussed separately.

There are two underlying issues in the Jiao-Zan comment to our paper¹ which are certainly controverted, but not yet fully solved. One is the extension to arbitrary dimensions of the notion of variance of a one-dimensional probability distribution $\rho(x)$, corresponding to some random variable X (e.g., position, momentum, ...) (see, e.g. *M. J. W. Hall*[Phys. Rev A 59, No. 4, 2602–2615 (1999; [doi:10.1103/PhysRevA.59.2602](#))] and *A. Dembo et al.* [IEEE Trans. Inf. Theory 37, No. 6, 1501–1518 (1991; [Zbl 0741.94001](#))]), that is, to a probability distribution $\rho(\vec{r})$ of a D-dimensional observable \vec{r} . Another issue is the definition of the Crámer-Rao complexity so that it approaches as close as possible the intuitive notion of complexity [*L. Rudnicki et al.*, Phys. Lett. A 380, No. 3, 377–380 (2016; [Zbl 1349.81065](#))].

MSC:

- [81P45](#) Quantum information, communication, networks (quantum-theoretic aspects)
- [94A17](#) Measures of information, entropy
- [33C45](#) Orthogonal polynomials and functions of hypergeometric type (Jacobi, Laguerre, Hermite, Askey scheme, etc.)

Full Text: [DOI](#)

References:

- [1] López-Rosa, S.; Toranzo, I. V.; Sánchez-Moreno, P.; Dehesa, J. S., Entropy and complexity analysis of hydrogenic Rydberg atoms, J. Math. Phys., 54, 052109, (2013) · [Zbl 1282.81054](#)
- [2] Hall, M. J. W., Universal geometric approach to uncertainty, entropy, and information, Phys. Rev. A, 59, 2602, (1999)
- [3] Dembo, A.; Cover, T. M.; Thomas, J. A., Information theoretic inequalities, IEEE Trans. Inf. Theory, 37, 1501, (1991) · [Zbl 0741.94001](#)
- [4] Rudnicki, L.; Toranzo, I. V.; Sánchez-Moreno, P.; Dehesa, J. S., Monotone measures of statistical complexity, Phys. Lett. A, 380, 377, (2016) · [Zbl 1349.81065](#)
- [5] Dehesa, J. S.; Plastino, A. R.; Sánchez-Moreno, P.; Vignat, C., Generalized Crámer-Rao relations for non-relativistic quantum systems, Appl. Math. Lett., 25, 1689, (2012) · [Zbl 1254.81033](#)

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