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Critical Nuclear Charge of the Quantum Mechanical Three-Body Problem

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The critical nuclear charge (Z_c) for a three-body quantum mechanical system consisting of positive and negative charges is the minimum nuclear charge that can keep the system in a bound state. Here we present a study of the critical nuclear charge for two-electron (heliumlike) systems with infinite nuclear mass, and also a range of reduced mass ratio (μ/m) up to 0.5. The results help to resolve a discrepancy in the literature for the infinite mass case, and they are the first to study the dependence on reduced mass ratio. It was found that Z_c has a local maximum with $\mu/m = 0.3525$. The critical charge for the infinite mass case is found to be $Z_c = 0.9110282240768(10)$. This value is more accurate than any previous value in the literature [1, 2, 3, 4], and agrees with the upper bound $Z_c = 0.91103$ reported by Baker et al.

[1]. The critical nuclear charge outside this range [0.5 – 1.0] still needs to be investigated in future works.

[1] J. D. Baker et al. Phys. Rev. A **41**, 1247 (1990).

[2] N. L. Guevara and A. V. Turbiner. Phys. Rev. A **84**, 064501 (2011).

[3] F. H. Stillinger Jr. J. Chem. Phys. **45**, 3623 (1966).

[4] G. A. Arteca et al. J. Chem. Phys. **84**, 1624–1628 (1986).

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