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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 ( $\mu/m$ ) 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  $\mu/m = 0.352$  5. The critical charge for the infinite mass case is found to be  $Z_c = 0.911$  028 224 076 8(1 0). This value is more accurate than any previous value in the literature [1, 2, 3, 4], and agrees with the upper bound  $Z_c = 0.911$  03 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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