Abstract Submitted
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Critical Nuclear Charge for Two-electron Atoms[1] C.S. ESTIENNE, Max Planck Inst., Garching, G.W.F. DRAKE, University of Windsor — There has been a recent revival of interest in the critical nuclear charge Z_c that is just sufficient to bind a nucleus of charge Z and two electrons in the $1s^2\ ^1S$ ground state [1–3]. It is conjectured that the inverse of critical charge is related to the radius of convergence $1/Z^*$ for a $1/Z$ expansion of the energy of the form $E(Z) = Z^2(E_0 + E_1/Z + E_2/Z^2 + \cdots)$. We have performed high precision variational calculations in Hylleraas coordinates, using the double basis set method [4], for values of Z very close to Z_c, with basis sets containing up to 2809 terms ($\Omega = 24$). Our preliminary result is $Z_c = 0.911\,028\,224\,077\,260(15)$, corresponding to $1/Z_c = 1.097\,660\,833\,738\,555(18)$. Well-defined eigenvalues continue to appear for $Z < Z_c$, possibly corresponding to quasibound states in the scattering continuum due to a shape resonance induced by the polarization potential of the core.

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