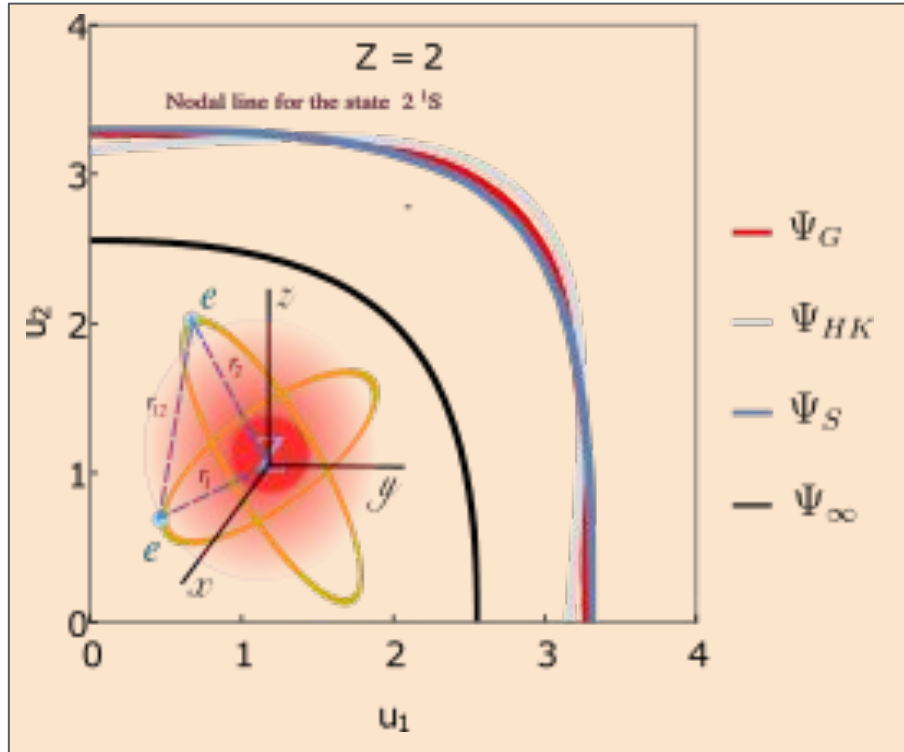# Ultra-Compact accurate wave functions for He-like and Li-like iso-electronic sequences and variational calculus. II. Spin-singlet (excited) and spin-triplet (lowest) states of Helium sequence

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Ultra-compact accurate wave functions in the form of generalized Hylleraas-Kinoshita functions which describe the domain of applicability of Quantum Mechanics of Coulomb Charges for spin-singlet (first) excited state 2^1S and for lowest spin-triplet 1^3S state of He-like ions are constructed. For both states we get an absolute accuracy for energy $\sim 10^{-3}$ a.u., exact values for cusp parameters and also for 6 expectation values a relative accuracy $\sim 10^{-2}$.   Bressanini-Reynolds observation about the special form of nodal surface of 2^1S state for Helium is confirmed and extended to ions with $Z > 2$. Critical charges $Z=Z_B$, where ultra-compact trial functions loose their square-integrability, are estimated: $Z_B(1^1S) \approx Z_B(2^1S) \sim$ 0.905 and $Z_B(1^3S) \sim$ 0.902.