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Calculation of Wave Function and Energy Levels of Muonic Atom

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The calculation of relativistic quantum wave function and energy levels of a muonic atom are performed in this work. We begin by solving the Dirac equation using the Notre Dame basis (ND) method with the Coulomb potential. The obtained results agree very well with other methods [1]. We improved the leading correction terms with a finite charge distribution from a nucleus atom and vacuum polarization for better estimates of the transition energies of a muonic atom. In this case, our results are different from other numerical methods, but they show similar trends, and the level spacing is comparable within 5% errors. We further improve our calculations with the dual-kinetic-basis (DKB) method with additional correction terms from recoil energy, and hyperfine structure.

References

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