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Relativistic corrections to helium two-photon decay rates

Wednesday, 8 June 2022 13:45 (15 minutes)

Two-photon transition rates are important in determining astrophysical quantities such as population balance in planetary nebulae. We recently calculated two-photon decay rates in heliumlike ions including the finite nuclear mass effects [1]. We have now perturbatively added relativistic corrections to these results, giving the most precise and accurate calculations to date. We first tested the relativistic corrections to dipole transition integrals for the equivalent one-electron case We derived (and will report on) one-electron Breit-Pauli operators that are equivalent to the corresponding Dirac operators by expanding in powers of the fine-structure constant α. A continuous gauge parameter is used, and the operators are compared with the long-wavelength QED operators derived previously for few-electron atoms [2].

[1] A. T. Bondy, D. C. Morton, and G. W. F. Drake. 102, 052807 (2020).
[2] K. Pachucki, Phys. Rev. A 69, 052502 (2004).

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