Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **296** Type: **Oral Competition (Graduate Student) / Compétition orale (Étudiant(e) du 2e ou 3e cycle)**

(G*) Two-photon decay rates in heliumlike ions: finite nuclear mass effects*

Monday 7 June 2021 12:59 (4 minutes)

Spontaneous two-photon decay rates for the $1s2s\ ^1S_0 - 1s^2\ ^1S_0$ transition in helium and its isoelectronic sequence up to $Z = 10$ are calculated, including the effects of finite nuclear mass. We use correlated variational wave functions in Hylleraas coordinates and pseudostate summations for intermediate states. The accuracy of previous work is improved by several orders of magnitude. Length and velocity gauge calculations agree to eight or more figures, demonstrating that the theoretical formulation correctly takes into account the three effects of (1) mass scaling, (2) mass polarization, and (3) radiation due to motion of the nucleus in the center-of-mass frame [1].

Algebraic relationships are derived and tested relating the expansion coefficients in powers of μ/M, where μ/M is the ratio of the electron reduced mass to the nuclear mass. Astrophysical applications of two-photon transitions to the continuum emission around 400 μm in planetary nebulae will be briefly discussed.

[1] A. T. Bondy, D. C. Morton, and G.W.F. Drake, Phys.\ Rev.\ A {\bf 102}, 052807 (2020).

*Research supported by NSERC and by SHARCNET.

Authors: BONDY, Aaron; DRAKE, G.W.F. (University of Windsor); Dr MORTON, Donald C. (Herzberg Astronomy and Astrophysics NRC)

Presenter: BONDY, Aaron

Session Classification: M2-1 Interaction between matter and light (DAMOPC) / Interaction entre matière et lumière (DPAMPC)

Track Classification: Atomic, Molecular and Optical Physics, Canada / Physique atomique, moléculaire et photonique, Canada (DAMOPC-DPAMPC)