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On the $1s2s2p\ ^4P^o_{5/2}$ metastable state in the Li-like ions

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The K-vacancy states in Li-like systems represent an unusually versatile workbench for the magnetic interactions. Indeed, in addition to their dipole allowed manifold, these states can also decay via strong magnetic transitions, some of them being almost as large as their E1 counterparts as shown recently by Bautista *et al.* [1] in the case of Fe^{23+}. The situation becomes critical for the $1s2s2p\ ^4P^o_{5/2}$ metastable state which radiatively decay mainly through both M1 and M2 transitions to $1s^22p\ ^2P^o_{3/2}$ and $1s^22s\ ^2S_{1/2}$, respectively. Moreover, the $1s2s2p\ ^4P^o_{5/2}$ level autoionizes mainly through the reaction $1s2s2p\ ^4P^o_{5/2} \rightarrow 1s^2\ ^1S_0 + e^-(\varepsilon f\ ^2F^0_{5/2})$ that ends up in the ground state of the He-like child ion, this autoionization being only possible via the spin-spin magnetic interaction.

A little more than 20 years ago, relativistic Auger and X-ray emission rates of the $1s2s2p$ configuration in some Li-like ions ($13 \leq Z \leq 92$) using Dirac–Hartree–Slater wavefunctions were published by Chen *et al.* [2]. More recently, Bautista *et al.* [1] reported detailed calculations of atomic data for the K-vacancy states of Li-like iron using different theoretical approaches. While these latter authors found a good agreement with Chen *et al.* [2] for the A-value of the dominant M2 radiative transition depopulating the $1s2s2p\ ^4P^o_{5/2}$ level, their Auger rate, obtained using the AUTOSTRUCTURE code in a Breit–Pauli relativistic framework, was a factor of 3 smaller than the previous calculation [2].

In the present work, we use four different atomic structure codes to reinvestigate the decay properties of the $1s2s2p\ ^4P^o_{5/2}$ metastable state in some Li-like ions, i.e. the multiconfigurational Breit–Pauli SUPERSTRUCTURE [3] and AUTOSTRUCTURE [4] programs, and the fully relativistic GRASP [5] and MDF-GME [6] codes that both implement the multiconfigurational Dirac–Fock method. Our calculations are compared with the few available previous theoretical and experimental studies.

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