Photoexcitation of He-like $2s2p\,^1P_1$ from $1s^2\,^1S_0$: radiative and autoionization decays.

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Photoionization/photoabsorption cross sections were computed by the Breit-Pauli R-matrix code [1] for $1s^2$ and $1s2s\,^1S_0$ near $2s2p\,^1P_1$. The method takes into account processes (1), (2) and (3). To insert process (4), we use Davies and Seaton radiative damping theory [2], as done in [3].

\[ (A) \quad 1s^2\,^1S_0 + \omega_1 \quad \rightarrow \quad 2s2p\,^1P_1 \quad \rightarrow \quad 1s + \epsilon_1p \quad (C) \]
\[ (2) \quad \downarrow \quad \rightarrow \quad (3) \quad \downarrow \quad (4) \quad l_{s2s\,^1S_0} + \omega_2 \quad (B) \]

$\omega$ and $\epsilon$ are photon and electron energies (a.u.). As example, we consider He-like iron. In figure 1, the cross-section for the transition $(A) \rightarrow (B)$ is plotted (continuous curve), i.e. $2s2p\,^1P_1$ to $1s2s\,^1S_0$ photo-excitation. This curve can be fitted to a Lorentzian profile (dashed line). In figure 2, the photoionization cross-section $(A) \rightarrow (C)$ is plotted (continuous line) as well as the photoabsorption cross-section (dashed line), which is the sum of the two preceding processes.

References: