Copper Fine-Structure K-shell Electron Impact Ionization Cross Sections for Fast-Electron Diagnostic in Laser-Solid Experiments

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The K-shell electron impact ionization (EII) cross section, along with the K-shell fluorescence yield, is one of the key atomic parameters for fast-electron diagnostic in laser-solid experiments through the K-shell emission cross section [1].

In addition, copper is a material that has been often used in those experiments because it has a maximum total K-shell emission yield [1]. Furthermore, in a campaign dedicated to the modeling of the K lines of astrophysical interest, the K-shell fluorescence yields for the K-vacancy fine-structure atomic levels of all the copper isonuclear ions have been calculated [2]. In this study, the K-shell EII cross sections connecting the ground and the metastable levels of the parent copper ions to the daughter ions K-vacancy levels considered in [2] have been determined. The relativistic distorted-wave (DW) approximation implemented in the FAC atomic code [3] has been used for electron kinetic energies up to 16 times the K-shell threshold energies. Moreover, the resulting DW cross sections have been extrapolated at higher energies using the asymptotic form proposed by Davies et al [1].

[1] J.R. Davies, et al., *Physics of Plasmas* **20**, 083113 (2013)
[2] P. Palmeri, et al., *Astron. Astrophys.* **543**; A44 (2012)
[3] M.F. Gu, *Astrophys. J.* **582**, 1241 (2003)