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## Simultaneous measurement of photorecombination and electron-impact ionization of Fe<sup>14+</sup> ions

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**Synopsis** Cross sections for photorecombination (PR) and for electron-impact ionization (EII) of astrophysically relevant Mg-like Fe<sup>14+</sup> ions have been measured by employing the electron-ion merged-beams technique at the Heidelberg heavy-ion storage ring TSR. Rate coefficients for PR and EII of Fe<sup>14+</sup> ions in a plasma are derived from the measurements. Both agree with the most recent theoretical results.

Cross sections for photorecombination (PR) and for electron-impact ionization (EII) of Mg-like Fe<sup>14+</sup> ions have been measured [1] (Fig. 1) by employing the electron-ion merged-beams technique at the Heidelberg heavy-ion storage ring TSR. The present findings together with our previous results for other Fe-M-shell and Fe-L-shell ions [2, 3] (and references therein) are relevant for the modelling of the charge balance in photoionized plasmas (PP) and collisionally ionized plasmas (CP). Moreover, the present results benchmark the most recent theoretical calculations for PR [4] and EII [5] of Fe<sup>14+</sup>. In the relevant temperature ranges (PP and CP ranges for PR; CP range for EII) both theoretical results agree with the experimentally derived rate coefficients within the systematic experimental uncertainty.

The simultaneous measurement of PR and EII under the same experimental conditions provides a unique opportunity for a comparison of recombination and ionization resonances [6]. The present comparison between PR and EII (Fig. 1) shows that corresponding recombination and ionization resonances are rare. Only the  $(2p^5 3s^2 3d \ ^3D_1) nl$  and  $(2p^5 3s^2 3d \ ^1P_1) nl$  intermediate levels contribute to both PR and EII. Ionization resonances beyond the respective series limits at 794.95 and 807.29 eV are associated with higher  $2p \rightarrow n'l'$  ( $n' \geq 4$ ) core excitations. The corresponding highly-excited intermediate levels strongly autoionize and therefore do not contribute significantly to PR.

### References

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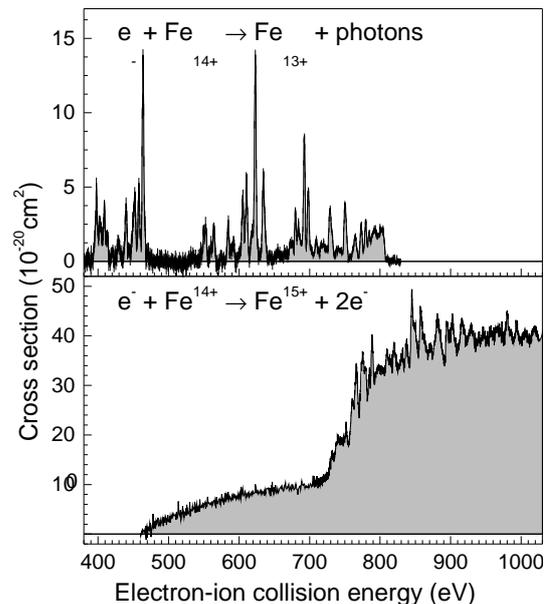
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**Figure 1.** Measured cross sections [1] for PR (top) and EII (bottom) of Fe<sup>14+</sup> ( $3s^2$ ). The resonances in both spectra are due to resonant dielectronic capture into  $2p^5 3s^2 3dnl$  doubly excited intermediate levels. Subsequent decay of these levels via radiative transitions or via double Auger decay leads to net recombination or net ionization, respectively. The ionization resonances appear on top of a continuous background signal due to direct ionization and excitation-autoionization.

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