Ion Storage Ring Measurements of Low Temperature Dielectronic Recombination Rate Coefficients for Modeling X-Ray Photoionized Cosmic Plasmas

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1. Reliable DR Data Needed

Low temperature dielectronic recombination (DR) is the dominant recombination mechanism for most ions in X-ray photoionized cosmic plasmas. Reliably modeling and interpreting spectra from these plasmas requires accurate low temperature DR rate coefficients. Of particular importance are the DR rate coefficients for the iron L-shell ions (Fe XVII-Fe XXIV). These ions are predicted to play an important role in determining the thermal structure and line emission of X-ray photoionized plasmas, which form in the media surrounding accretion powered sources such as X-ray binaries (XRBs), active galactic nuclei (AGN), and cataclysmic variables (Savin *et al.*, 2000).

The need for reliable DR data of iron L-shell ions has become particularly urgent after the launches of *Chandra* and *XMM-Newton*. These satellites are now providing high-resolution X-ray spectra from a wide range of X-ray photoionized sources. Interpreting the spectra from these sources requires reliable DR rate coefficients. However, at the temperatures relevant for X-ray photoionized plasmas, existing theoretical DR rate coefficients can differ from one another by factors of two to orders of magnitudes.

2. New Program at Max-Planck-Institute

To address the need for accurate low temperature DR rate coefficients of the iron L-shell ions, we have initiated a program of measurements for DR via $2 \rightarrow 2$ core excitations using the heavy-ion Test Storage Ring located at the Max-Planck-Institute for Nuclear Physics in Heidelberg, Germany. To date measurements have been carried out for Fe XVIII (Savin *et al.*, 1997, 1999), Fe XIX (Savin *et al.*, 1999), Fe XX (Savin et al 2002), Fe XXI, Fe XXII, and Fe XXIV. A detailed discussion of our results can be found in the references cited.

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