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

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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.

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. Here we review our work to date, discuss the implications of our results, and map out our future research efforts.

References:

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