

# Dielectronic recombination of open $L$ -shell argon

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**Synopsis** In this talk, we present the measurements of dielectronic recombination of open  $L$ -shell argon ions which are done at the Shanghai electron beam ion trap. The  $KLL$  dielectronic recombination of He-like to O-like argon has been clearly observed, and the contributions of different charge states have been well resolved.

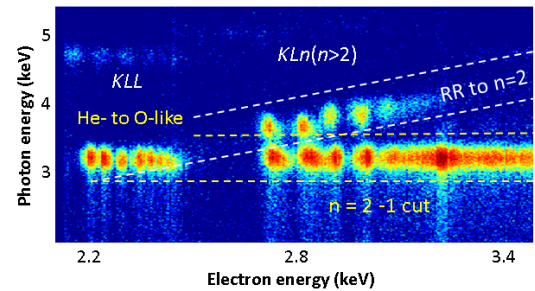
Dielectronic recombination (DR) plays an important role in hot plasmas relevant to astrophysics, inertial confinement fusion and magnetic confinement fusion. DR of He-like ion has been extensively studied in the past decades with the advent of the electron beam ion traps (EBIT). Effects, such as Breit interaction, polarization and interference between DR and radiative recombination (RR) have been carefully considered to deduce precise DR resonance strengths [1, 2, 3]. A scaling law of DR resonance strengths has been inferred and validated [4].

Apart from He-like ions, the open  $L$ -shell ions, i.e., the Li-like to O-like ions, also contribute significantly for the hot plasmas [5]. However, rare works focus on DR of open  $L$ -shell ions, especially it is true for low- $Z$  ions. The parameters of the scaling law have relatively large errors for the open  $L$ -shell ions. One of the reasons can be attributed to the lack of DR data for low- $Z$  ions [6, 7]. Comparing with high- $Z$  ion, one difficulty for measuring DR of open  $L$ -shell low- $Z$  ion is to resolve these ions with different charge states. The resonance energies of Li-like to O-like ions are more adjacent for low- $Z$  ions, and this demands narrower width of the electron beam energy and higher resolution power of X-ray detectors.

In the present work, we measured DR of He-like to O-like argon at the Shanghai-EBIT [8, 9]. The X-rays emitted from the excited argon ions were recorded with a high-purity germanium detector. The electron beam energy was scanned from 2.15 to 3.50 keV. The beam current was restricted to a low level, i.e., 25 mA, to reduce the electron beam energy spread, and a spread of about 20 eV has been achieved. The lower electron beam current is helpful for the production of lower charged states, i.e., the open  $L$ -shell ions. Besides, we increased the gas injection pressure to  $1.3 \times 10^{-7}$  torr to enhance charge exchange.

A typical experimental result is shown in Fig. 1.

As shown in the figure, the  $KLL$  DR of ions with different charge states, i.e., from He-like to O-like ions, are clearly observed and well resolved, accompanying with the RR event. By normalizing to the theoretic RR cross sections, it is convenient to obtain DR resonance strengths of the open  $L$ -shell argon. Detailed analysis of the experimental data is in progress, and the experimental DR resonance strengths will be presented and discussed in this talk.



**Figure 1.** 2D scatter plot of photon counts as functions of x-ray and electron energies

## References

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