

# Absolute Recombination Rate Coefficients of Highly Charged Tungsten Ions

K. Spruck<sup>\*</sup>, A. Becker<sup>†</sup>, D. Bernhardt<sup>\*</sup>, M. Grieser<sup>†</sup>, M. Hahn<sup>\*\*</sup>,  
C. Krantz<sup>‡</sup>, M. Lestinsky<sup>‡</sup>, A. Müller<sup>\*</sup>, O. Novotný<sup>\*\*</sup>, R. Repnow<sup>†</sup>,  
D. W. Savin<sup>\*\*</sup>, A. Wolf<sup>†</sup> and S. Schippers<sup>\*</sup>

<sup>\*</sup>*Institute for Atomic and Molecular Physics, Justus-Liebig-University Giessen,  
Leihgesterner Weg 217, 35292 Giessen, Germany*

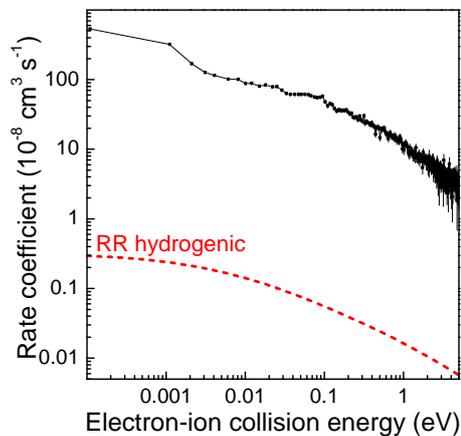
<sup>†</sup>*Max Planck Institute for Nuclear Physics, Saupfercheckweg 1, 69117 Heidelberg, Germany*

<sup>\*\*</sup>*Columbia Astrophysics Laboratory, Columbia University, New York, NY 10027, USA*

<sup>‡</sup>*GSI Helmholtz Center, Planckstrasse 1, 64291 Darmstadt, Germany*

**Abstract.** Ionization and recombination processes involving tungsten ions are of major interest for the fusion community. Since tungsten is used for plasma facing walls in nuclear fusion reactors, impurities of highly charged tungsten ions in the fusion plasma are inevitable. Radiation from these excited tungsten ions leads to plasma cooling. In order to control the plasma conditions, detailed knowledge of the atomic processes and atomic structures of tungsten ions are required. To date, most of the needed atomic data come from theory and only a small fraction is contributed by experimental measurements.

Here, we report on electron-ion recombination experiments of highly charged tungsten ions performed at the TSR storage ring in Heidelberg, Germany. Absolute experimental rate coefficients of several  $W^{q+}$  ions with  $18 \leq q \leq 21$  were measured. As an example, the merged-beam recombination rate coefficient of  $W^{20+}$  [1] is shown below. The impact of the measured rate coefficients on the modeling of fusion plasmas will be discussed.



Measured merged-beams rate coefficient for electron-ion recombination of  $W^{20+}$  at low relative collision energies [1]. The dash-dotted curve is the calculated merged-beams rate coefficient for radiative recombination (RR) using a hydrogenic approximation. Note that the measured rate coefficient is three orders of magnitude larger.

## References

- [1] S. Schippers *et al.*, Phys. Rev. A **83**, 012711 (2011).