

Abstract Submitted
for the GEC18 Meeting of
The American Physical Society

Dirac B-spline R-Matrix Calculations for e–Xe⁺ collisions.¹

KLAUS BARTSCHAT, OLEG ZATSARINNY, Drake University, YANG WANG, YAN-FEI WANG, XI-MING ZHU, Harbin Institute of Technology — Xenon is the most important ingredient for electric propulsion systems, including Hall and ion thrusters. The performance of these devices depends critically on the kinetic processes involving Xe⁺ ions. However, in numerical simulations of such thrusters, excited states of Xe⁺ cannot be studied due to the lack of fundamental cross-section data. Also, ionic emission lines are absent in the non-invasive diagnostic approach of optical emission spectroscopy, due to the lack of collisional-radiative models based on a reliable set of atomic data. We applied a relativistic Dirac B-spline R-matrix (DBSR) method to calculate oscillator strengths and electron-impact excitation cross sections for the 5s²5p⁵, 5s5p⁶, 5p⁴6s, 5p⁴5d, 5p⁴6p, 5p⁴7s, and 5p⁴6d states of Xe⁺, which exhibits a complex open-shell structure with strongly term-dependent orbitals. The excitation cross sections from the ground, metastable, and quasi-metastable states of Xe⁺ are analyzed. We will use the present e–Xe⁺ cross sections together with those obtained for e–Xe [1] to build a complete CR model and to compare its predictions with experimental data from Hall and ion thrusters. [1] O. Zatsarinny and K. Bartschat, *Phys. Scr.* **T134** (2009) 014020.

¹Work supported by the United States National Science Foundation under PHY-1520970, PHY-1803844, and XSEDE-090031, and by the National Natural Science Foundation of China under grant Nos. 11775063 and 11404081.

Klaus Bartschat
Drake University

Date submitted: 14 Jun 2018

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