Abstract Submitted
for the GEC20 Meeting of
The American Physical Society

A collisional-radiative model benchmarking and comparative study of fusion relevant atoms[1] NATHAN A. GARLAND, MARK C. ZAMMIT, CHRISTOPHER J. FONTES, JAMES COLGAN, Los Alamos National Laboratory, HYUN-KYUNG CHUNG, National Fusion Research Institute, XIAN-ZHU TANG, Los Alamos National Laboratory — Accurate predictive capability of ion charge state and radiation profiles is a crucial input to modeling collisional, fusion-relevant discharges. With an eye to ITER operations, such applications include nitrogen injection into the cooler, collisional boundary-layer during quiescent operation, or injection of neon into a discharge experiencing a disruption event. In many of these cases, the collisionality of the discharge rapidly increases and the composition and radiative potential of the plasma must be determined. While many collisional-radiative (CR) modeling approaches have been developed over the years, it is not always clear when and why certain models, and their assumptions, should be applied to given applications. In this work we seek to provide highly accurate benchmark calculations of fusion-relevant atoms and from there, assess the strengths and limitations of decreasing model detail depending on the application at hand. In particular, we examine the requirements for producing detailed spectroscopic information, compared to more forgiving quantities such as ion stage population distributions for plasma modeling. We also comment on the time-evolution of CR systems, and detail the restrictions this imposes on using steady-state data for plasma modeling purposes.

[1]This work supported by the LDRD program of Los Alamos National Laboratory under project number 20200356ER.

Nathan A. Garland
Los Alamos National Laboratory

Date submitted: 15 Jun 2020 Electronic form version 1.4