Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Collisional-radiative modeling applied to post-disruption fusion plasmas with a runaway electron component[1] N.A. GARLAND, Los Alamos National Laboratory, H.-K. CHUNG, National Fusion Research Institute, C.J. FONTES, M.C. ZAMMIT, J COLGAN, C.J. MCDEVITT, Los Alamos National Laboratory, T WILDEY, Sandia National Laboratories, X.-Z. TANG, Los Alamos National Laboratory — Relativistic runaway electrons generated in post-disruption tokamak discharges have the capacity to cause significant damage. A primary disruption mitigation approach currently being considered for ITER is to inject large amounts of high-Z impurities, such as neon or argon. Interaction between runaway electrons and high-Z impurities can set both the runaway evolution and the plasma cooling rate, through impurity ion charge state distribution and radiative power loss. In order to generate greater understanding of these properties, we have extended upon the popular FLYCHK collisional-radiative model, with focus on modeling fusion plasmas where high-Z impurities are introduced and a minority relativistic energy electron population is present. Novel to our CR model is inclusion of relativistic effects for electron impact inelastic cross-sections integrated over an arbitrary electron energy distribution. It is shown that significantly different predictions are produced when full relativistic effects are present, highlighting the importance of accurate atomic data in improving our understanding of fusion science. By accounting for these vital phenomena with the help of uncertainty quantification, we demonstrate a much improved predictive capability for CR modeling of fusion plasmas.

[1]Work supported by DoE through OFES and TDS SciDAC.

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Date submitted: 02 Jul 2019 Electronic form version 1.4