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Collisional-radiative modeling of fusion relevant plasmas with relativistic electron components[1] NATHAN A. GARLAND, Los Alamos National Laboratory, HYUN-KYUNG CHUNG, National Fusion Research Institute, CHRISTOPHER J. FONTES, MARK C. ZAMMIT, JAMES COLGAN, XIANZHU TANG, Los Alamos National Laboratory — Relativistic electrons generated in post-disruption tokamak discharges have the ability to cause significant damage to devices such as ITER. 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 relativistic electrons and high-Z impurities can modulate the electron distribution function and the plasma cooling rate, so it is crucial to understand the 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 to accommodate relativistic effects of inelastic electron impact cross-sections. It is shown that significant differences in ion charge state and radiative losses are produced by including these relativistic effects, when compared to results produced without these effects using a thermal Maxwellian electron distribution only, as commonly done in the fusion community. Unique spectral signatures of relativistic electrons are analyzed, offering options for possible diagnostic methods in future. This work highlights the importance of accurate atomic data in improving predictive capabilities of these complex plasmas in fusion science.

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