Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Angular distributions for electron-impact ionization of noble gases and their application to plasma modeling[1] JAMES COLGAN, MARK ZAMMIT, NATHAN GARLAND, JUN LI, CHRIS FONTES, XIANZHU TANG, Los Alamos Natl Lab — The problem of runaway electrons in plasma kinetics modeling is under renewed scrutiny as efforts ramp up to model fusion plasma devices as the construction of ITER proceeds. The problem occurs when atomic impurities are injected into fusion plasmas to mitigate disruptions. The ionization of such impurities can occur through interaction with the bulk electron plasma component or from the relativistic runaway electrons. The angular distribution of the ejected electrons from such ionization events is not normally considered within coupled plasma simulation efforts and could lead to unphysical results of the bulk plasma properties and the electron energy distribution. To this end, we have calculated the triple differential cross sections for He, Ne, and Ar, using both the time-dependent close-coupling and distorted-wave approaches. We find that the largest cross sections occur when the scattered electron retains most of the available energy after ionization and is almost undeflected by the target. The angular distribution of the ejected electron, is strongly peaked at momentum transfer directions away from the scattered electron, in contrast with the isotropic distribution assumed in plasma simulations. We discuss our calculations and explore the consequences of these results.

[1]This work was supported by the US Department of Energy through the Los Alamos National Laboratory. Los Alamos National Laboratory is operated by Triad National Security, LLC, for the National Nuclear Security Administration of U.S. Department of Energy (Contract No. 89233218NCA000001).

James Colgan
Los Alamos Natl Lab

Date submitted: 02 Feb 2020 Electronic form version 1.4