

Abstract Submitted
for the GEC18 Meeting of
The American Physical Society

Modification of the Coulomb logarithm due to electron-neutral collisions GERJAN HAGELAAR, LAPLACE, CNRS and University of Toulouse, ZOLTAN DONKO, Wigner Research Center for Physics, Hungary, NIKOLAY DYATKO, Troitsk Institute for Innovation and Fusion Research — We investigate the validity of the binary collision operator used to describe the effect of electron-electron Coulomb interactions in Boltzmann calculations of the electron distribution function in weakly ionized gases. In order to do this, we compare results from such Boltzmann calculations with those from particle simulations in which the electron-electron Coulomb interactions are described from first principles, via Molecular Dynamics techniques. It turns out that significant differences can arise, for example in the calculated drift velocity in xenon at low reduced electric field, because the Coulomb interactions are perturbed by electron collisions with neutral gas particles. We demonstrate that this effect can be included in the Boltzmann collision operator by a simple modification of the Coulomb logarithm, derived from elementary physical considerations. This modified Coulomb logarithm brings the Boltzmann calculations in perfect agreement with the first-principles simulations, over a wide range of conditions.

G.J.M. Hagelaar
LAPLACE, CNRS and University of Toulouse

Date submitted: 19 Jun 2018

Electronic form version 1.4