Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

An atomic and molecular fluid model for efficient edge-plasma transport simulations at high densities.[1] THOMAS ROGNLIEN, MARVIN RENSINK, Lawrence Livermore National Lab — Transport simulations for the edge plasma of tokamaks and other magnetic fusion devices requires the coupling of plasma and recycling or injected neutral gas. There are various neutral models used for this purpose, e.g., atomic fluid model, a Monte Carlo particle models, transition/escape probability methods, and semi-analytic models. While the Monte Carlo method is generally viewed as the most accurate, it is time consuming, which becomes even more demanding for device simulations of high densities and size typical of fusion power plants because the neutral collisional mean-free path becomes very small. Here we examine the behavior of an extended fluid neutral model for hydrogen that includes both atoms and molecules, which easily includes nonlinear neutral-neutral collision effects. In addition to the strong charge-exchange between hydrogen atoms and ions, elastic scattering is included among all species. Comparisons are made with the DEGAS 2 Monte Carlo code.

[1]Work performed for U.S. DoE by LLNL under Contract DE-AC52-07NA27344.

Thomas Rognlien
Lawrence Livermore National Lab

Date submitted: 15 Jul 2016 Electronic form version 1.4