Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

Effects of large-angle collisions on inertial confinement fusion plasmas[1] A.E. TURRELL, M. SHERLOCK, S.J. ROSE, London, South Kensington, London, SW7 2AZ, UK — Large-angle Coulomb collisions cause energetic fusion produced ions to up-scatter thermal fuel ions to many times their initial energy in a single collision, creating fast "knock-on" ions. These collisions are not included in models of plasmas based on fluids or the Vlasov-Fokker-Planck equation but they affect the exchange of energy in fusion plasmas, and the evolution of ion distribution functions. It is well known that the relative importance of large-angle Coulomb collisions to small-angle collisions is $\mathcal{O}(1/\ln\Lambda)$. Their effects are expected to be important in the $2 < \ln\Lambda < 5$ regime, which includes high intensity laser-plasma interactions at solid density, ICF, and stellar cores. In this regime, large-angle collisions are infrequent but have noticeable effects because they transfer large amounts of energy per collision. Knock-on ions generated by this process have experimentally detectable signatures, including in neutron spectra. We present a method which uses plasma Monte Carlo techniques to include the effects of large-angle Coulomb collisions in fusion plasmas and which self-consistently evolves distribution functions according to the creation of knock-on ions of any generation. The method is applied to "burn" in the hot fuel in inertial confinement fusion capsules.

[1]Supported by an EPSRC Doctoral Prize Fellowship

Arthur Turrell
Imperial College London

Date submitted: 03 Jul 2014 Electronic form version 1.4