Abstract Submitted
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Applying the Braginskii Ion Fluid Model to Reaction Yields and Product Energy Spectra BRIAN APPELBE, JEREMY CHITTENDEN, AIDAN CRILLY, KRIS MCGLINCHEY, CHRIS WALSH, JON TONG, Imperial College London — Collisional plasmas can be described using the Braginskii ion fluid model. This can be used calculate transport fluxes (e.g. ion heat flux and viscosity) as a result of driving thermodynamic forces (temperature gradients and the rate of strain tensor, respectively) by the derivation of a set of transport equations from the kinetic equations. The solutions to these transport equations are perturbations to the Maxwellian distribution function. In this work we investigate how nuclear reaction yields and the energy spectra of reaction products are affected by the driving thermodynamic forces. The transport equations for a plasma with multiple ion species are solved using a set of associated Laguerre polynomials which define the perturbation to the distribution function. The set of polynomials is then used to calculate reaction yields and energy spectra. The model is applied to the plasma conditions found in ICF and MagLIF hotspots. It is shown that the temperature and fluid velocity gradients present in these plasmas can cause significant broadening of the neutron spectra. This broadening can cause the ion temperature inferred from the spectral width to be higher than the burn-averaged ion temperature of the plasma.

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