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Charge State Fluctuations and Temperature Equilibration in Warm Dense Matter RORY BAGGOTT, STUART MANGLES, Imperial College London — In warm dense matter, many of the properties are strongly influenced by the charge states of the ions. This is often taken into account by way of the mean ionization or the average charge state populations. However, even in steady state, the number of electrons remaining bound to a particular ion is not constant. Stochastic collisional ionisation and recombination will cause the charge states of ions to fluctuate around their mean. In this work, we use a random walk model to investigate the properties of charge state fluctuations in warm dense matter. A strong dependence on the atomic shell structure is predicted. We also examine the possibility that charge state fluctuations contribute to electron-ion temperature equilibration by interacting with ion density fluctuations. Despite its importance, temperature equilibration remains poorly understood, with many experimental results yielding disagreements with theory. Preliminary calculations suggest that charge state fluctuations could be a significant factor in understanding temperature relaxation.

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