

Friday, August 7th
9:30 AM Session

Distribution of Ions in Laser-Driven Fusion Reactions

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Experiments of laser-driven fusion reactions are important for many aspects, such as measuring the cross section of plasma. In the experiments at University of Texas the Texas Petawatt Laser irradiates deuterium clusters of various sizes suspended in ^3He gas absorb laser's energy. The clusters undergo a Coulomb explosion, forming a hot plasma which initiates the reactions. This analysis studies two possible fusions: $\text{D(d, } ^3\text{He)n}$ and $^3\text{He(d,p)}^4\text{He}$. Signals are recorded using a Faraday cup detector, then transformed and analyzed in energy space. In this work we investigate if the log-normal distribution is an appropriate description of the energy distribution of the ions. If the log-normal distribution is a good fit, the energy distribution can be thought of as chaotic enough to appear thermalized. The chaos may be due to many-body interactions over long distances, as well as the different charges and masses of the particles involved. Using the well known S-factor for the two reactions and the extrapolated fits, the number of fusions is calculated and compared with experimental data.