

PlasmaPy for HEDP Regime*

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PlasmaPy is a Python package being developed to foster an open source software ecosystem focused around plasma physics research and education. The high-energy-density (HED) physics regime refers to systems with an energy density >1 Mbar or 10^6 atm. In this regime, plasmas behave differently from ideal plasmas and require additional functionality to describe them. For example, ionization, magnetic fields, and relativity can be important in this regime. I am tasked with adding functionality to PlasmaPy that is relevant to HED plasma physics. One such function is the magnetic Reynolds number (R_m): which is the ratio of magnetic induction to diffusion in a conducting fluid, where a large R_m indicates an ideal magnetohydrodynamic (MHD) fluid and a small R_m indicates a resistive MHD or that this fluid is in the diffusive limit. Another example is the Saha equation: which estimates the ratio of ions of a plasma in one ionization state to those in another. This becomes more accurate in the HED regime. Relativistic particles are also more abundant in the HED regime therefore relativistic functions are needed. Future efforts will be to add functionality for processing and analyzing data from experimental facilities such as the ZEUS laser in Michigan.

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