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Modelling of Laser Driven Neutron Sources

In order to meet the increasing demand for neutron sources, laser driven sources are a potential candidate for compact sized devices.
The setup for a laser driven neutron source can be split into two separate parts, first the laser acceleration of protons or deuterium from thin targets, second the ion to neutron conversion process.
Combining those parts into one model and predicting the output performance is difficult since both parts require different physics approaches.
The first part of this contribution focuses on the optimization of the acceleration mechanism utilizing particle-in-cell (PIC) simulations.
Parameter studies in simplified 1.5D geometries are used to extract optimized laser parameters. In the second part neutron converter studies and optimization via Monte Carlo simulations are presented. This includes a review of nuclear codes in the needed energy range for a correct estimation of neutron production.
Last, an effective combined model for the identification and optimization of all important parameters is presented. This is supposed to aid the design of a modular laser neutron source, to be added to existing laser systems.

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