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## Recent advances in theoretical and numerical studies of Z-pinch driven inertial confinement fusion in the IAPCM

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Fast Z-pinch has produced the most powerful X-ray radiation source in laboratory and also shows the possibility to drive inertial confinement fusion (ICF). The recent advances in the Z-pinch theoretical and numerical researches at the IAPCM are presented. We use a detailed circuit model to study the energy coupling between the generator and the Z-pinch process. With the full circuit model (FCL code) and MHD model (2-D MARED code), the simulation of the propagation of electromagnetic wave pulse from the generator to the load is studied, the compression, the amplification and the transmission of the pulse has been observed. The simulation results could show about the information of the pulse at some locations of the generator. The experiments conducted on the PTS facility that is the most powerful pulsed-power generator for Z pinch study in China recently validated our part simulation results. Specifically, the calculated electric parameters in front of the insulation stack, such as voltages and currents, show a quantitative agreement with the experimental results. The implosion parameters of wire-array Z-pinches, such as implosion velocities and convergence ratios agree qualitatively with the diagnosed results. Our codes can apply not only in optimal design of wire-array load, but also in the research of key issues of Z-pinch driven fusion. Recently, we are concentrating on the problems of Z-pinch driven ICF, such as quasi-spherical wire-array implosions, dynamic hohlraum and capsule implosions. When a quasi-spherical implosion (QSI) is used to drive a dynamic hohlraum system, the enhanced energy density helps to improve the energy-transport efficiency and increase the shock-induced radiation intensity of the foam convertor. We found that the quality of QSI can be enhanced by changing its initial shape to a prolate one, and it is more practical for wire array fabrication. The implosion dynamics of a tungsten wire-array Z-pinch embedded with a CH foam convertor, especially the impaction interaction of the wirearray plasma with the convertor plasma, is numerically investigated using a 1-D non-equilibrium radiation MHD code. A suitable radius ratio of the wire-array to the convertor, neither too large to induce strong MRT instability nor too small to gain a small kinetic energy of the wire-array before impacting onto the convertor surface, should be selected.

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