



Kinetic Thermonuclear Burn Studies with VPIC on Roadrunner

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Abstract

The particle-in-cell code VPIC will be used to investigate the physics of thermonuclear (TN) burn in kinetic plasma. Several kinetic and collective physics processes can arise during thermonuclear burn that have the potential to modify our basic understanding of fundamental physics models in our integrated codes. These include: alpha particle ranges and electron/ion energy split. With carefully diagnosed VPIC simulations of burning plasma, these physics processes can be studied at unprecedented fidelity. The proposed simulations on the LANL Roadrunner supercomputer aim to identify fundamental physics processes that could modify understanding of TN burn and help refine burn models within existing multi-physics codes. We request 4.5 million hours (approximately two weeks of wall-clock time) of the full Roadrunner system for these simulations.