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Laser-Plasma Interactions on NIKE and the Fusion Test Facility[1]

LEE PHILLIPS, JAMES WEAVER, NRL — Recent proposed designs for a Fusion Test Facility (FTF) (Obenchain et al., Phys. Plasmas 13 056320 (2006)) for direct-drive ICF targets for energy applications involve high implosion velocities combined with higher laser irradiances. The use of high irradiances increases the likelihood of deleterious laser plasma instabilities (LPI) but the proposed use of a 248 nm KrF laser to drive these targets is expected to minimize the LPI risk. We examine, using simulation results from NRL's FAST hydrocode, the proposed operational regimes of the FTF in relation to the thresholds for the SRS, SBS, and 2-plasmon instabilities. Simulations are also used to help design and interpret ongoing experiments being conducted at NRL's NIKE facility for the purpose of generating and studying LPI. Target geometries and laser pulseshapes were devised in order to create plasma conditions with long scalelengths and low electron temperatures that allow the growth of parametric instabilities. These simulations include the effects of finite beam angles through the use of raytracing.

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