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High-Speed Pellet Injection for Ignition Experiments by Ignitor[1]

F. BOMBARDA, A. FRATTOLILLO, S. MIGLIORI, ENEA, Italy, L.R. BAYLOR, ORNL, B. COPPI, MIT — he path to ignition chosen by the Ignitor program[2] is based on the outstanding confinement and purity properties of high density plasma regimes. Typically, these correspond to peak densities $n_0 \cong 0.7 - 1 \times 10^{21}\mathrm{m}^{-3}$ and were discovered and investigated originally by axisymmetric high magnetic field machines. Record high values of density and confinement time were obtained on the Alcator C machine following the injection of deuterium pellets that were intended to stabilize modes of the ITG kind. In order to control the density profile during the initial current rise phase of the discharge, which is critical for optimizing the Ohmic and fusion heating rates in Ignitor, a fast pellet injector has been developed in collaboration between ENEA and ORNL. The 4- barrel, two stage injector will deliver pellets of different size and speeds into the plasma from the low field side. The Ignitor Pellet Injector (IPI) has completed two experimental campaigns, reaching pellet speeds up to 2 km/s, and a third campaign is due soon. After reaching the target performances ($\leq$ 4 km/s), the injector will be ready for installation on existing experiments. Simulations carried out for JET and LHD indicate that on both devices the IPI could provide much needed deep fueling in high temperature plasmas.

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[2]B. Coppi, A. Airoldi, et al., *Nucl. Fusion* **41(9)**, 1253 (2001)

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