Supersonic gas jet fueling experiments in NSTX


— A high-pressure supersonic deuterium jet (SDJ) characterized by Mach number 4 has been used for fueling of ohmic and 2-6 MW NBI-heated L- and H-mode plasmas in NSTX. Reliable H-mode access was obtained with steady-state low field side fueling from the SDJ at a flow rate up to $4.5 \times 10^{21} \text{s}^{-1}$. Good progress has been made toward a controlled density H-mode scenario with SDJ fueling: the flow rate of the uncontrolled high field side gas injector was reduced by up to 20. As a result, comparable or slightly higher core and pedestal densities were obtained, with 5-15% reduction of core and pedestal temperatures, and a change in the ELM regime from Type I and small, Type V ELMs to Type III ELMs. The SDJ fueling efficiency was found to be a function of the SDJ pressure (density) and the plasma - SDJ distance, typically held at 5-15 cm. Typical fueling efficiency values inferred from the plasma electron inventory analysis were in the range 0.1 - 0.35. Fast camera imaging of the SDJ indicated that the gas jet penetrated through the scrape-off layer and ionized before reaching the separatrix. This work is supported by U.S. DOE under Contracts No. W-7405-Eng-48 and DE-AC02-76CH03073.

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