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Molecular Cluster Injection for High-Density Fueling on the Lithium Tokamak eXperiment (LTX)[1] D.P. LUNDBERG, R. KAITA, R. MAJESKI, D.P. STOTLER, Princeton Plasma Physics Laboratory — LTX is designed to reduce global recycling, by reducing the neutral hydrogen density in the plasma edge with a liquid lithium wall. Gas-based fueling systems, such as wall-mounted gas puffers or supersonic gas injectors, are ill-suited for use in a low-recycling plasma, as they source a significant amount of gas into the plasma edge. Following experiments on the HL-2A tokamak by Yao, et al. (Nucl. Fusion 47(2007) 1399), a Molecular Cluster Injector (MCI) was designed to supply a high-density, collimated fueling source for LTX. When operated with H_2 backing pressures of 50-150psia, a 4ms MCI pulse produces molecular densities of 1-4x10^{16} cm^{-3} at distances over 20cm from the nozzle, and supplies a particle flux of 340-775 torr-lit/s, sufficient to replace the predicted LTX particle inventory. The H_2 density profiles are consistent with flows that produce molecular clusters of a few hundred molecules each, which is expected to improve neutral penetration into the plasma core, relative to pure gas-phase injection. The neutral penetration into LTX plasmas will be diagnosed by a fast visible camera with an H_α filter, as well as microwave interferometry.

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