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**MST Pellet Injector Upgrades to Probe Beta and Density Limits and Impurity Particle Transport** K.J. CASPARY, B.E. CHAPMAN, J.K. ANDERSON, S.T.A. KUMAR, S.T. LIMBACH, S.P. OLIVA, J.S. SARFF, J. WAKSMAN, UW - Madison, S.K. COMBS, C.R. FOUST, ORNL — Upgrades to the pellet injector on MST will allow for significantly increased fueling capability enabling density limit studies for previously unavailable density regimes. Thus far, Greenwald fractions of 1.2 and 1.5 have been achieved in 500 kA and 200 kA improved confinement plasmas, respectively. The size of the pellet guide tubes, which constrain the lateral motion of the pellet in flight, was increased to accommodate pellets of up to 4.0 mm in diameter, capable of fueling to Greenwald fractions $> 2.0$ for MST's peak current of 600 kA. Exploring the effect of increased density on NBI deposition shows that for MST's NBI, core deposition of 25 keV neutrals is optimized for densities of $2 - 3 \times 10^{19}$ $m^{-3}$. This is key for beta limit studies in pellet fueled discharges with improved confinement where maximum NBI heating is desired. In addition, a modification to the injector has allowed operation using alternative pellet fuels with triple points significantly higher than that of deuterium (18.7 K). A small flow of helium into the pellet formation vacuum chamber introduces a controllable heat source capable of elevating the operating temperature of the injector. Injection of methane pellets with a triple point of 90.7 K results in a 12-fold increase in the core carbon impurity density. The flow rate is easily adjusted to optimize injector operating temperature for other fuel gases as well. Work supported by US DoE.

Kyle Caspary
UW - Madison

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