Investigation of Global Momentum Confinement Times on DIII-D*

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Momentum confinement was investigated in ELMy H-mode plasmas with elevated q_{min} (with the intent of avoiding the complication of sawteeth from the analysis). Torque scans were performed at constant β_N, and the rotation profile was monitored using charge exchange recombination (CER) spectroscopy. Studies of the mechanical angular momentum in the plasma show a nonlinear response to the applied neutral beam torque. This response translates into a torque dependence of the momentum confinement time, specifically showing that momentum confinement time degrades as the torque is increased. This is somewhat analogous to the more familiar observation of degradation of energy confinement with increased power.

Under nominally balanced neutral beam injection, the plasma maintains a significant rotation in the same direction as the plasma current (co-rotation). This rotation is conceptually related to the "intrinsic rotation" observed in the absence of auxiliary momentum input. It is critically important to account for this intrinsic rotation in any global momentum confinement analysis. The intrinsic rotation can be modeled as being due to an offset in the applied torque (i.e. an "anomalous torque"), with a magnitude comparable to a co-neutral beam source.

*Supported by the US Department of Energy under DE-AC02-76CH03073 and DE-FC02-04ER54698.