Performance and Stability Limits at Near-unity Aspect Ratio in the Pegasus Toroidal Experiment

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The accessible parameter space at near-unity aspect ratio in the Pegasus Experiment has been increased. $Beta_t$ values up to 25% ($beta_N \sim 5$) were obtained with no evidence of a limit, while densities range up to the Greenwald limit. A toroidal field utilization factor up to 1.2 and normalized currents greater than 5 have been achieved. The stored energy is consistent with expectations from the ITER98pby2 scaling. Plasma startup is characterized by high current ramp rates (15-45 MA/s) and low internal inductance ($li \sim 0.3$). The current is usually limited by volt-seconds or a large m/n = 2/1 MHD instability, which results in a rapid decrease in dI_p/dt. The appearance of this mode is coincident with $q(0) <= 2$ and low shear across a broad region of the plasma interior. A more complete set of magnetic diagnostics was installed to better characterize these plasmas. Increased ohmic power, HHFW pre-heating, variable shaping, improved conditioning and gas handling, and transient high toroidal field during plasma formation provide new tools to control the MHD activity and move closer to near-unity beta plasmas in this geometry.

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