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HIGH TOROIDAL FIELD UTILIZATION AND CHARACTERIZATION IN THE PEGASUS TOROIDAL EXPERIMENT[1]

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The PEGASUS Toroidal Experiment is an ultra-low-aspect-ratio ST focused on exploring the MHD stability limits at high normalized current, I_N, and high toroidal beta. Initial operations were characterized by high toroidal betas at very low toroidal field ($B_t \leq$ 0.07T) but were limited due to large resistive MHD modes and power supply waveform-control capability. Upgrades to the facility have added improved position and shape control, increased, time-variable toroidal-field control, and programmable loop voltage control. The upgrades allow for greater flexibility in q(r,t) tailoring and should provide access to $I_p/I_{tf} > 1$ and the external kink boundary. Equilibrium and stability (DCON) modeling projects stable equilibria approaching $I_p/I_{tf} \sim 3$ ($I_N \sim 20$). The primary operational campaign is concentrated on defining the external kink boundary, which will determine accessibility to the low-q, high I_N operational space. Present experiments are focused on resistive MHD mode suppression with the additional waveform control. Electrostatic plasma guns have been installed in the divertor region to provide plasma startup without a central solenoid. The guns produce an extended reconnected plasma region with up to 16 kA of toroidal current, but closed flux surfaces appear to require increased injected current. Preparations are underway for a high-power test of EBW heating and current drive in an overdense ST plasma. The low-field capability of PEGASUS allows MW-level tests with economical 2.45 GHz RF technology.

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