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H-mode and Edge Physics on the Pegasus ST: Progress and Future Directions[1] M.W. BONGARD, G.M. BODNER, J.L. BARR, M.G. BURKE, R.J. FONCK, E.T. HINSON, D.M. KRIETE, B.T. LEWICKI, J.M. PERRY, J.A. REUSCH, D.J. SCHLOSSBERG, K.E. THOME, G.R. WINZ, University of Wisconsin-Madison — Ohmic H-modes are routinely attained on the Pegasus ST, in part due to the low L-H power threshold P_{LH} arising from low-B_T operation at $A \sim 1$. Characteristics of H-mode include: improved τ_e, consistent with $H_{98} \sim 1$; edge current and pressure pedestal formation; and the occurrence of ELMs. Experiments in the past year have examined magnetic topology and density dependencies of P_{LH} in detail. P_{LH} exceeds ITER L-H scaling values by 10–20×, with P_{LH}/P_{ITPA08} increasing sharply as $A \to 1$. No P_{LH}-minimizing density has been found. Unlike at high-A, P_{LH} is insensitive to limited or diverted magnetic topologies to date. The low B_T and modest pedestal values at $A \sim 1$ afford unique edge diagnostic accessibility to investigate ELMs and their nonlinear dynamics. $J_{edge}(R,t)$ measured through a Type I ELM shows a complex pedestal collapse and filament ejection. These studies are being extended to higher I_p and longer pulse length with LHI startup to conserve Ohmic V-s and improve MHD stability. A modest-cost upgrade to the facility will enable detailed validation studies of nonlinear ELM dynamics and ELM control. This initiative will upgrade the centerstack, increasing B_T by ×3, Ohmic V-s by ×4, and pulse lengths to 100 ms at $A < 1.3$, as well as deploy a comprehensive 3D magnetic perturbation coil system with full poloidal coverage from frame coils and helical centerstack windings.

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