Edge current profile measurements of peeling-like modes at high $\langle j_{\text{edge}}/B \rangle$ in PEGASUS$^1$ M.W. BONGARD, R.J. FONCK, E.T. HINSON, B.T. LEWICKI, A.J. REDD, University of Wisconsin-Madison — Large-scale, coherent, high-$m$ filamentary edge instabilities are routinely observed under conditions of high $\langle j_{\text{edge}}/B \rangle$ in PEGASUS. These ELM-like filaments are characterized with high-speed imaging, as well as scanning magnetic and Langmuir probes. Their properties include: low- to intermediate-$n$; a coherent electromagnetic signature; large poloidal coherence lengths; rotation with the bulk plasma; and explosive detachment from the edge with outboard radial propagation. Stability is sensitive to $j_{\text{edge}}$, with mode drive or suppression dependent on the sign of $\dot{I}_p$. The extremely low $B (B_{t,0} \leq 0.1 \text{ T})$ and high $j_{\text{edge}} \approx 0.1 \text{ MA/m}^2$ in PEGASUS lead to high peeling instability drive, proportional to $\langle j_{\text{edge}}/B \rangle$, comparable to that achieved in H-mode on larger experiments. However, in PEGASUS $j_{\text{edge}}$ is driven by large $\dot{I}_p (\leq 50 \text{ MA/s})$ and associated skin currents as opposed to a localized region of high bootstrap current in an H-mode pedestal. A new radial array of Hall-effect sensors measures internal $B_{\theta,\text{edge}}(R)$ directly with high spatial and temporal resolution to provide strong experimental constraint on $j_{\text{edge}}(\psi)$ in equilibrium reconstructions. Such equilibria may be used to uniquely test predictions of peeling-ballooning stability theory.

$^1$Supported by U.S. D.O.E. Grant DE-FG02-96ER54375.