Paleoclassical Model for Edge $T_e$ Pedestal

J.D. CALLEN, Univ. of Wisconsin, Madison, WI 53706-1609, M.A. MAHDAVI, T.H. OSBORNE, General Atomics, San Diego, CA 92186 — A model is proposed for the edge electron temperature profile $T_e(\rho)$ in high (H) confinement mode, diverted tokamak plasmas based on the paleoclassical model [1] for the minimum possible radial electron heat transport. In the paleoclassical model as one moves inward from the separatrix the electron heat diffusivity first decreases (until $\lambda_e \sim \pi R q$); then it increases moving further inward into the paleoclassical collisional (Alcator-scaling) regime. The $T_e$ profile predictions from the paleoclassical model as one moves inward from the separatrix are: 1) first an increasing $T_e$ gradient with $\eta_e \equiv d \ln T_e/d \ln n_e = 2$, 2) a maximum $|\nabla T_e|$ where $q$ drops to $\sim 5$–7, 3) then a decreasing $T_e$ gradient, and 4) finally a pedestal electron pressure determined by balancing collisional paleoclassical transport against gyro-Bohm-scaled anomalous electron heat transport, $\beta_p^e \equiv n_e^p T^p_e / (B^2 / 2 \mu_0) \propto a/R q$, which implies $p^e_p \equiv n^p_e T^p_e \propto B_p B_t$. The relatively favorable comparisons of these paleoclassical model predictions with DIII-D experimental data on H-mode $T_e$ pedestals just before an ELM will be shown.


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