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Threshold for Neoclassical Tearing Modes in DIII–D¹ R.J. LA HAYE, General Atomics, O. SAUTER, CRPP — At sufficiently high poloidal beta β_{θ} and low collisionality, m/n = 3/2 tearing modes are excited in the DIII–D tokamak by a q = 1 sawtooth perturbation. The resulting islands of full radial width w are long lived and reduce global confinement (and β_{θ}) by up to 30%. The tearing modes are metastable. They are produced by the perturbed neoclassical bootstrap current destabilization from a seed island arising from toroidal coupling to the m/n = 2/2 sawtooth precursor. Even if the modes are conventionally stable, *i.e.*, $\Delta' < 0$, for sufficiently high β_{θ} there is a range of island widths w above some threshold value over which the modified Rutherford equation predicts island growth. This threshold value increases with collisionality. Both "transport" and "polarization" threshold models are compared to experiment. The transport model critical island w_d is 3 to 9 times too small depending on whether ion or electron parallel heat transport is assumed. The polarization model critical island w_g gives good agreement with experiment utilizing an approximately hyperbolic tangent transition from collisionless to collisional regimes.

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