Multi-Device Dimensionless Scaling of Neoclassical Tearing Mode Beta Limit¹ R.J. LA HAYE, General Atomics, R.J. BUTTERY, H.R. WILSON, Euratom/UKAEA Fusion Association Culham, S. GUENTER, MPI f. Plasmaphysik, G.T.A HUYSMANS, Jet Joint Undertaking (now at CEA, Cadarache) — To extrapolate the neoclassical tearing mode (NTM) beta limit to reactor grade tokamaks, a multi-device database has been compiled from Asdex-Upgrade, DIII-D, and JET. The key issue in predicting the NTM beta limit is the relative scaling of the “seed” island $w_s$ to the threshold island $w_{th}$. For sawtooth induced $m/n = 3/2$ NTM, the relative threshold island width is taken from the polarization/inertial model² as $w_{th}/r \propto \rho_{ts} g^{1/2}(\epsilon, \nu)$ where $g$ is a function of collisionality $\nu = \nu_i/\epsilon \omega_{ci}$ that increases from 1 at low $\nu$ to $\epsilon^{-3/2} \gg 1$ at high $\nu$. The relative seed island scaling, allowing for the dynamics of geometrically coupled perturbations as a function of magnetic Reynolds number $S$,³ is taken as $w_s/r \propto \beta_0^7 S^{-\alpha} \propto \rho_{ts}^{3\alpha} \nu^\alpha$ for $\gamma = \alpha/2$. Thus the scaling of $w_s/w_{th} \propto \rho_{ts}^{3\alpha-1} \nu^\alpha$ with $\rho_{ts}$ depends critically on whether $\alpha \lesssim 1/3$. Best fits of experimental data will be presented.

¹Work supported in part by U.S. DOE Contract DE-AC03-99ER54463 and the U.K. Dept. of Trade and Industry and Euratom.