Criteria for Suppression of Neoclassical Tearing Modes[1] F.W. PERKINS, PPPL, R.W. HARVEY, CompX — This work reports a theoretical determination of the level of Electron Cyclotron Current Drive (ECCD) needed to suppress Neoclassical Tearing Modes. The ratio of peak driven current density j_{cd} to the bootstrap current density j_{bs} is the appropriate figure-of-merit. Altogether there are four criteria. The first governs complete stabilization of NTMs and requires modulated ECCD. The second is the criteria for the existence of two additional fixed points of the island evolution equation, which should limit an NTM to a width comparable to the width of the driven current layer w_{cd}. The same condition $j_{cd} > 1.6\,j_{bs}$, evaluated for continuous ECCD, fulfills both criteria. The third criterion governs the ability to decrease the size of existing, saturated islands. For islands with a saturation width $w_{sat} > w_{cd}$, the criterion is $j_{cd} > 0.16\,j_{bs}\,(w_{sat}/w_{cd})$. The fourth criterion concerns the ability to increase the quantity $(-\Delta')$ by a thin, continuous current drive layer centered on the rational surface. The criterion $j_{cd} > 0.6\,j_{bs}$ leads to an island size $w < w_{cd}$. Estimates show that these criteria can be fulfilled by the ECCD facilities planned for DIII-D and Next Step devices.

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Special instructions: MHD, immediately following RJ La Haye

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