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Theory Experiment

Sawtooth Suppression by Tearing Modes in Hybrid Plasmas on DIII-D,* C.C. Petty, P.A. Politzer, *GA*; W.W. Heidbrink, *UCI*; R. Nazikian, *PPPL*; S.L. Allen, *LLNL* – Hybrid discharges have the remarkable property that the $m/n=3/2$ neoclassical tearing mode (NTM) raises the central safety factor (q_0) above unity and suppresses sawteeth. Experiments on DIII-D are trying to distinguish between several sawtooth suppression mechanisms. One mechanism that can be tested for is the redistribution of the beam ions by the $3/2$ NTM, which would increase the off-axis neutral beam current drive (NBCD). The NBCD profile can be determined from the evolution of the poloidal flux measured by motional Stark effect (MSE) polarimetry. Also, the fast ion D_α (FIDA) diagnostic can measure the fast ion density profile for hybrid discharges with and without the $3/2$ NTM. Another analysis tool is TRANSP simulations of the current profile evolution, which shows that diffusion of the beam ions is unlikely to raise q_0 above 1. Other possible sawtooth suppression mechanisms are hyper-resistivity, counter current drive in the plasma core via a coupling between the $3/2$ NTM and a $2/2$ sideband, and magnetic flux pumping.

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