

Sawtooth control with ECCD on Tore Supra

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The issue of sawtooth control is extremely important in view of avoiding sawtooth-triggered instabilities, like NT modes and ELMS, in a reactor-size tokamak. The aim of the study presented here is to investigate the effect of localised current drive on the Sawtooth activity. In recent experiments in Tore Supra, Electron Cyclotron Current Drive has been observed to strongly affect the Sawtooth period, even at modest ECCD power levels. The effect of ECCD on the sawteeth has been seen to depend critically on the radial location of the driven current. With 5 MW of Central ICRH, the sawtooth period was increased from 150 ms up to 500ms by addition of 0.6MW of counter-ECCD while application of the same amount of counter-ECCD power but at a different radial position in discharges with 2.5 MW of LHCD results in a reduction of the Sawtooth period from 100ms to 60ms. In other discharges co-ECCD has been seen to either reduce or increase the Sawtooth period depending on the radial location of the driven current. In all these experiments it is estimated that only 2-3% of the total current was driven by ECCD, but this was sufficient to significantly affect the sawtooth period provided the driven current was localized accurately with respect to the $q=1$ surface. A comparison of these new results with both previous experiments and theoretical predictions will be presented. In addition, the requirements in terms of real-time control capabilities will be assessed for a similar method to be applied as a viable tool for NTM avoidance in ITER.