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P1.1043 A new instability and a new nonlinear MHD simulation pattern for rapid sawtooth crash

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See the full abstract here:
http://ocs.ciemat.es/EPS2019ABS/pdf/P1.1043.pdf

The rapid sawtooth crash without magnetic reconnection during crash phase is a longdebated issue in fusion plasma. In relatively high central beta plasma, nonlinear simulation with the extended MHD code predicted that it is unstable to a new type of instability over q=1, a nonlinear ideal-MHD unstable mode with coupled n=1 and 2 harmonics, that grows to an internal-kink-like sawtooth crash. A perturbation with n=1 and m=2/n=2 remains over q=1 and couples to other harmonics across the entire plasma radius, consistent with observations of annular hot belt in many tokamaks like JET and TFTR [1,2]. No large 2/1 magnetic island after fast collapse is seen in simulation. Large axis-symmetric flow can be produced after rapid sawtooth crash.

[1] A W Edwards et al PRL 57 (1986) 211
[2] Zhang C et al PRL 77 (1996) 3553

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