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Simulation of Chirping Avalanche in Neighborhood of TAE gap[1]

HERB BERK, BORIS BREIZMAN, GE WANG, LINJIN ZHENG, Institute for fusion studies, University of Texas at Austin — A new kinetic code, CHIRP, focuses on the nonlinear response of resonant energetic particles (EPs) that destabilize Alfven waves which then can produce hole and clump phase space chirping structures, while the background plasma currents are assumed to respond linearly to the generated fields. EP currents are due to the motion arising from the perturbed field that is time averaged over an equilibrium orbit. A moderate EP source produces TAE chirping structures that have a limited range of chirping that do not reach the continuum. When the source is sufficiently strong, an EPM is excited in the lower continuum and it chirps rapidly downward as its amplitude rapidly grows in time. This response resembles the experimental observation of an avalanche [1], which occurs after a series of successive chirping events with a modest frequency shift, and then suddenly a rapid large amplitude and rapid frequency burst to low frequency with the loss of EPs. From these simulation observations we propose that in the experiment the EP population is slowly increasing to the point where the EPM is eventually excited.
[1]. M.Podesta et.al. Phys.Plasma, 16, 056104(2009)

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