

Wave driven fast ion loss in the National Spherical Torus Experiment

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Spherical tokamaks, with their relatively low toroidal field, extend fast ion driven instability physics to parameter ranges not normally accessed in conventional tokamaks. The low field means that the fast ion larmor radius normalized to the plasma minor radius and the ratio of the fast ion velocity to the Alfvén speed are relatively large. The large larmor radius of the modes enhances mode particle interactions, influencing the structure of the unstable mode spectrum. The relatively large fast ion velocity allows for more ion-mode resonances, resulting in stronger coupling of the fast ion population to the instabilities, i.e., increasing the drive. It is therefore an important goal of the present proof-of-principle spherical tokamaks to evaluate the role of fast ion driven instabilities in fast ion confinement. In this paper is presented the first observations of fast ion losses resulting from toroidal Alfvén eigenmodes and a new fishbone-like energetic particle mode.