

Kink Mode Study in EAST High β_P Plasma

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Two types of kink modes, fishbone and long-lived mode are experimentally and numerically studied at EAST tokamak. In high β_P plasma, sawtooth instability was replaced by a saturated 1/1 internal kink mode which either manifests itself as a periodical burst energetic ion related fishbone or as a long-lived mode which is associated to the core safety factor at $q_0 \sim 1$. The presence of those 1/1 internal modes are beneficial to the sustainment of hybrid scenario with extended regions of low-magnetic shear profile and $q_0 \sim 1$, because of that they can expel high-Z impurity and can make flux pumping. The mechanism responsible for the flux pumping caused by kink mode was numerically in nonlinear 3D magnetohydrodynamic simulations using the M3D code. Furthermore, M3D+K code hybrid simulation shows a good agreement to the fishbone activity in EAST. Sawtooth crash replaced by 1/1 dominated helical mode and bursting of many toroidal harmonics ($n=2$ to $n=7$) in hybrid scenario are also confirmed by M3D simulation.

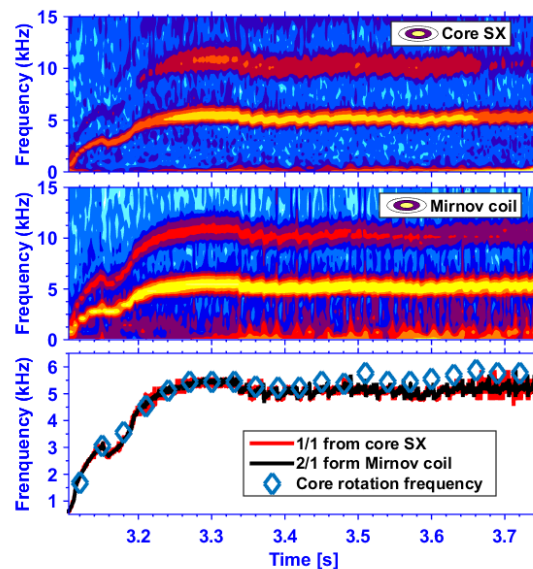


Figure 1. Long-lived mode in EAST low-magnetic shear profile and $q_0 \sim 1$ hybrid plasma.