

First time observation of local current shrinkage during the MARFE behavior on the J-TEXT tokamak

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Multifaceted asymmetric radiation as well as strong poloidal asymmetry of the electron density from the edge, dubbed as ‘MARFE’, has been observed in high electron density Ohmically heated plasmas on J-TEXT tokamak. Equilibrium reconstruction based on the measured data from the 17-channel FIR polarimeter–interferometer indicates that an asymmetric plasma current density distribution forms at the edge region and the plasma current shrinkage locates at the MARFE affected region. Furthermore, associated with the localized plasma current shrinkage, a locked mode MHD activity is excited, which then terminate the discharge with a major disruption. Localized plasma current shrinkage at the MARFE region is considered to be the direct cause for the density limit disruptions, and the proposed interpretation is consistent with the experimental observations.