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Stabilization of the Helically Trapped Energetic Ions driven Resistive Interchange Mode by on-axis Electron-Cyclotron-Heating in a Helical Plasma

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A bursting resistive interchange mode destabilized by the resonant interaction with the helically trapped energetic ions (EIs), named as the helically trapped energetic-ion-driven resistive interchange modes, or 'EIC' , has been identified in Large Helical Device (LHD). It can induce the significant loss of the EIs in plasma peripheral region. Therefore, the control of the EICs is important. It is found that when the electron-cyclotron-heating (ECH) near the magnetic axis is superimposed, the EIC locating in the plasma peripheral region is mitigated. The EIC can be further fully stabilized when the power of the ECH exceeds a certain threshold. The ratio of the gyro-radius of the trapped EIs to the radial width of the resistive interchange mode (k_r*rho_EI) is the key parameter to explain the observed stabilising effect. That is, the FLR effect is thought to play an important role on the observed stabilization of the EIC in LHD.

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