# Feedback stabilization of tearing modes in a tokamak plasma



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**Abstract**
Tokamak plasmas are prone to instabilities such as tearing modes, which disturb the magnetic topology and deteriorate plasma confinement. Tearing modes are driven by perturbations of the local magnetic field components and current distribution near rational flux surfaces. Feedback control schemes are required to prevent destabilization of tearing modes. At the TEXTOR tokamak, a real-time feedback control system for the suppression of tearing modes has been implemented and operated. The control system closes the feedback loop between an Electron Cyclotron Emission (ECE) sensor, which monitors the tearing modes, and an Electron Cyclotron Resonance Heating and Current Drive (ECRH/ECCD) actuator. High power electron cyclotron waves are injected into the plasma and directed at the tearing modes via a steer-able mirror to provide localized heating and current drive, which suppresses the modes. A detailed system description together with a presentation of the achieved experimental results will explain how the control system is able to focus the applied ECRH/ECCD accurately at a tearing mode's center, is able to track tearing modes autonomously and stabilizes the modes in real-time.