Mitigation of anomalous electron energy transport via control of sub-cyclotron AEs in STs

Motivation

- Beam-driven CAEs/GAEs have been excited in NSTX(-U), MAST, DIII-D, and have been experimentally linked to anomalous T_e flattening in NSTX
- Understanding conditions for excitation is vital to predict and control effects on plasma confinement

Completed Work

- Simulations of CAE/GAE excitation performed for wide range of NBI parameters provides wealth of information on stability
- Derived simple analytic conditions for CAE/GAE stability
  - Agrees with spectra in large NSTX experimental database
  - Explains GAE suppression on NSTX-U with off-axis beam
  - Indicates new avenues for control with multi-beam distributions

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Remaining Work

- Simulations of CAE stabilization with multi-beam distributions
- Simulations of energy channeling due to multiple modes
  - Single CAE case studied by Belova *et al*. in 2015 PRL

Main Takeaways

- Mechanisms for control of CAEs/GAEs are needed to study and avoid anomalous electron energy transport in STs
- Detailed theoretical studies have improved our understanding of instability conditions, providing new strategies for stabilizing these modes with multi-beam distributions