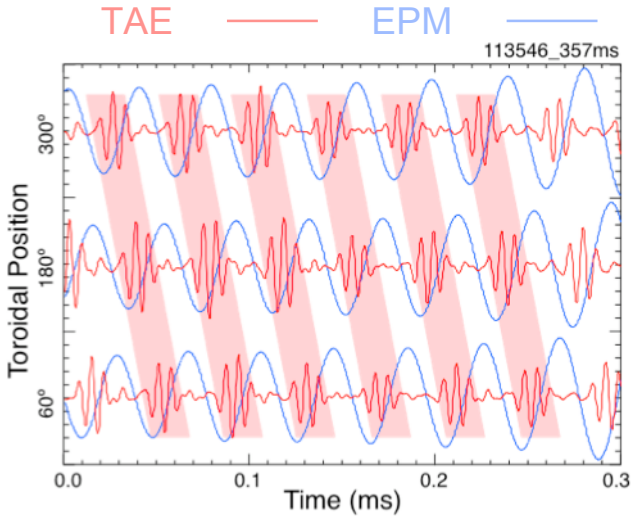
Error field modulation of TAEs via three-wave interaction

- Three-wave interaction of fast-ion modes common in NSTX neutral beam heated plasmas
- Three-wave interactions influence fast-ion transport — often observed during fast-ion loss events
- Interaction with the EPMs toroidally localizes TAEs into wave-packets



- *Proposed experiment*: Systematically study effect of toroidal amplitude modulation of TAEs on fast-ion population and transport
  - impose rotating error field with error field coils (i.e. replace EPM) — look for TAE amplitude modulation (edge coils, reflectometers)
    - vary error field below locking threshold to control strength of modulation
  - look for toroidal variation in fast-ion population (FIDA, sFLIP, NPA+ssNPA)
    - slow rotation (compared to EPM) conducive to good statistics vs. error field phase

TAE stability and effect TAE-induced transport on rotation and NB current Drive

- TAE stability depends on fast-ion β — threshold depends on NB source
- NB induced rotation and NB current drive sensitive to fast-ion pitch angle — pitch angle varies with source
- TAE induced fast-ion transport affects both NB induced rotation and NB current drive
- *Proposed experiment*: investigate source dependence of TAE stability and of effect TAE-induced fast-ion transport on rotation and current
  - vary neutral beam power level and source composition independently
  - identify source dependence of fast-ion β stability threshold of TAEs
  - characterize source dependence of fast-ion transport in weakly unstable and avalanche regimes
  - characterized impact fast-ion transport on current and rotation using TRANSP and other tools
- *Q. Why revisit TAE stability?* Stability addressed in previous XPs!
  A. Improved diagnostics available.
  - PCHERS, 8 channel reflectometer (other diagnostics?)

Continuum interaction — RSAE/TAE coupling to KAWs

- Continuum interaction of TAEs and RSAEs common in NSTX — expected to excite kinetic Alfvén waves (KAW)
- KAWs have $k_r\rho_s \sim 1$ — Landau damp on background plasma
- Coupling to KAWs (a.k.a. *radiative damping)* can more efficiently damp RSAEs and TAEs than direct Landau damping on background plasma — changes how fast-ions heat plasma
- *Proposed experiment:* Experimentally observe and characterize KAWs excited by continuum interaction
  - Use fine-spaced reflectometer comb array (5 ch, Δf = 350 MHz) to measure short radial scale density fluctuations
  - Vary plasma q-profile to move continuum interaction region through reflectometer measurement region