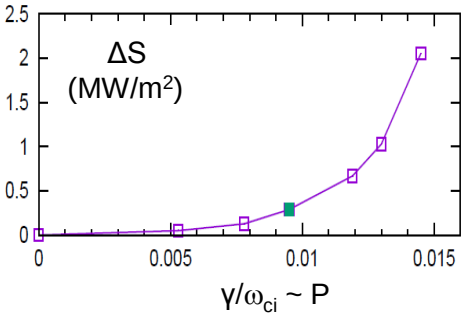
Coupling of Neutral-beam-driven Compressional Alfvén Eigenmodes to Kinetic Alfvén Waves in NSTX and Energy Channelling

CAE-to-KAW energy channeling shows strong scaling with the beam power

- Simulations using the HYM code demonstrate strong coupling of the beam-driven CAE to kinetic Alfvén wave at the Alfvén resonance location.
- CAE-to-KAW coupling can channel energy of the beam ions to the location of the resonant mode conversion at the edge of the beam density profile.
- Provides an alternative explanation to the observed reduced heating of the plasma core at high beam power in NSTX.
- Nonlinear simulations of CAEs predict strong energy channeling at high beam powers.

  - Calculated power absorption at the resonance agrees with previous quasilinear estimates, P= (0.3-0.5) MW – supporting the energy channelling mechanism[1].

  - Absorption rate shows a very strong scaling with growth rate: $\Delta S \sim (\gamma/\omega_{ci})^5$, implying that the energy loss at the KAW resonance scales as $\sim P^5$.



Calculated change of the energy flux across the Alfven resonance (resonant power absorption) vs γ.

[1] E. V. Belova, et al., Phys. Rev. Lett., **115**, 015001 (2015).