

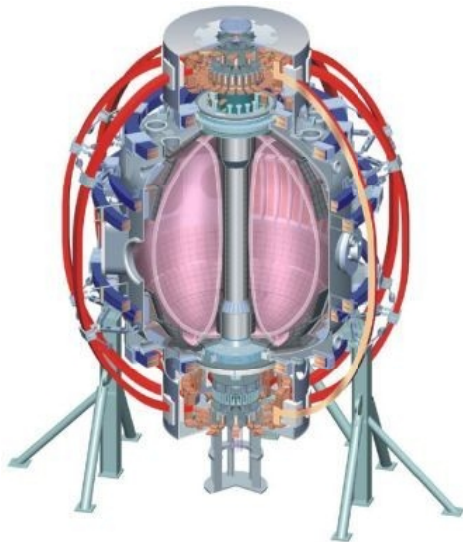
# Effects of Global Alfvén Eigenmodes on Electron Thermal Transport in NSTX

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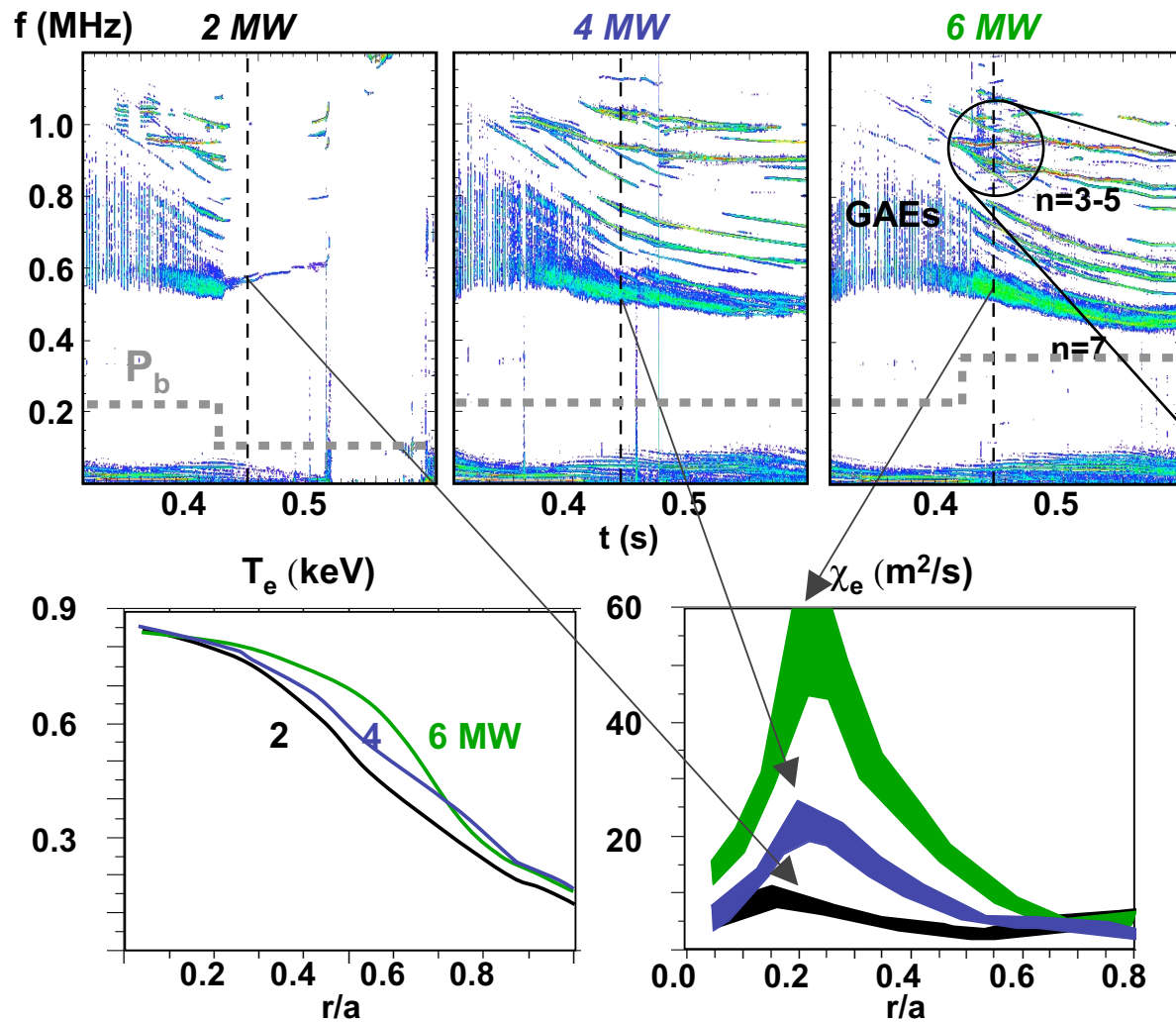
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# GAE modes proposed as possible mechanism for rapid electron thermal transport in plasma core



*D. Stutman, PRL 2009*

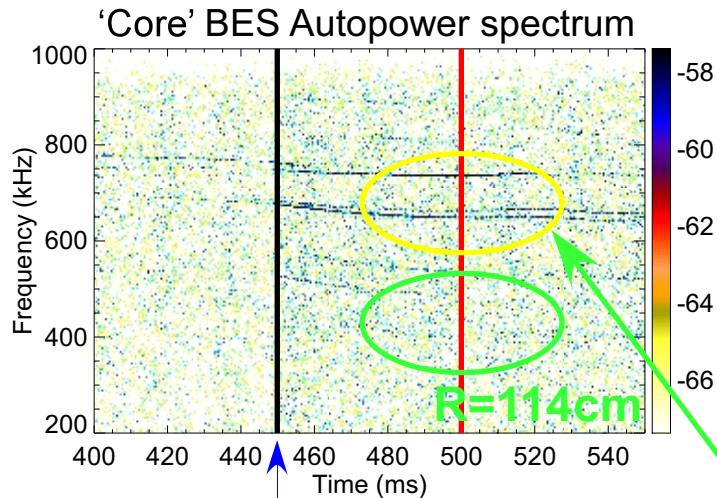
Power spectra from magnetic pickup coils

Convergence/divergence of mode frequencies evidence of GAEs

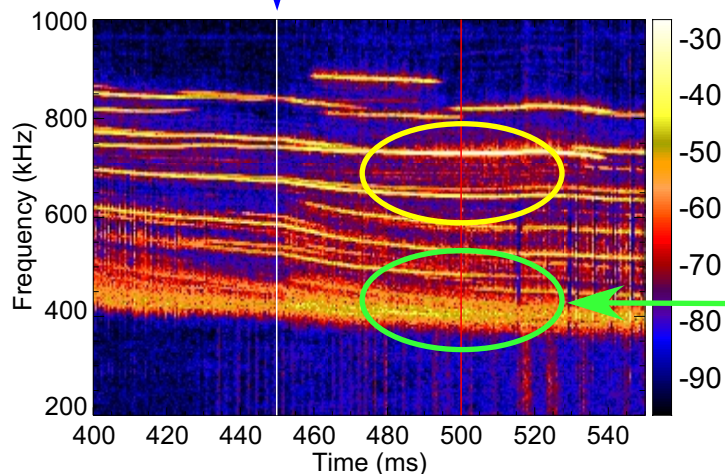
$$\omega_j = v_A k_{||j} \approx v_A \frac{m_j - n_j q}{q R_0}$$

- GAE activity correlates strongly with  $P_{\text{NBI}}$  steps and enhanced core electron thermal transport

# Initial BES measurements show GAE peaking at $R \sim 120\text{cm}$ ( $r/a \sim 0.36$ ) in region of enhanced transport

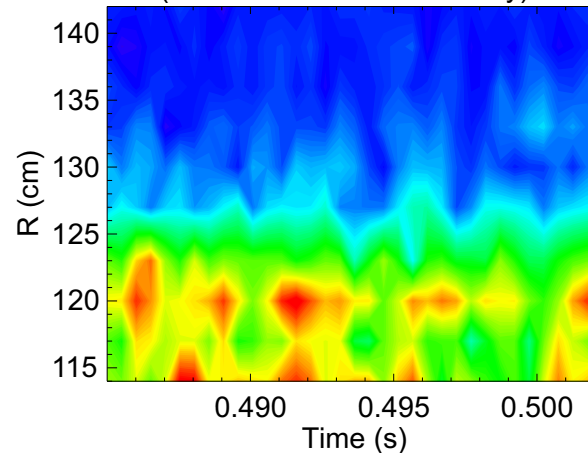


PNBI 4- $\rightarrow$ 6MW

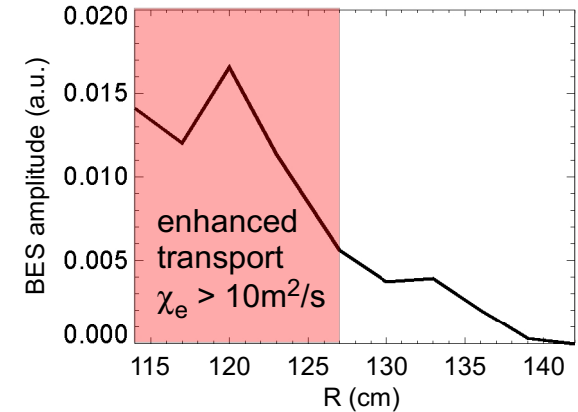


Mirnov magnetic pickup coil

$\sim \delta n$  amplitude of 738kHz GAE ( $\delta I$  normalized to NB density)

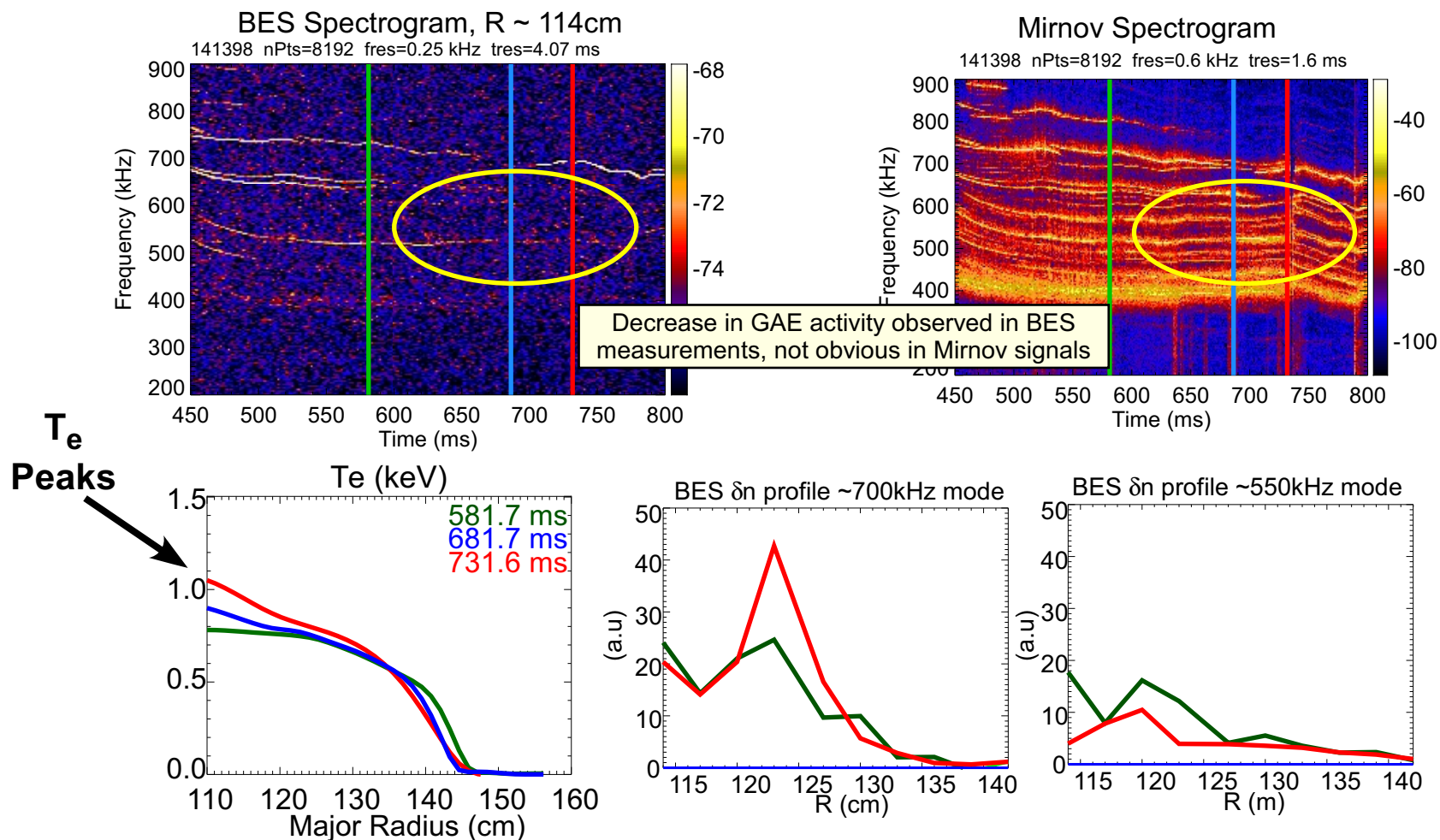


$\delta I/I$  amplitude of 738kHz GAE (17ms average)



- BES spectrogram shows high-intensity GAE modes  $R < \sim 135\text{cm}$   $\sim 5\text{-}10\text{dB}$  above background
- Mirnov pickup coils reveal additional, lower amplitude modes below BES detector limit

# Decrease in GAE activity corresponds with peaking of central electron temperature



- $T_e$  remains peaked even with large single mode (bulk GAEs still largely suppressed)
- Good measurements of GAEs, but data set is sparse ~1 shot/condition
- Need high-k core data to determine if high-k turbulence limits central  $T_e$  gradient

# XP Goal: Study transition between GAE driven and gradient driven ( $\mu$ tearing?) electron thermal transport (11-1)

- Revisit GAE XP with repeated shots under more limited conditions
- Use high-k diagnostic, polarimetry? for fluctuations in plasma core

Shot list combination of high/low field, high/low  $P_{\text{NBI}}$ :

$P_{\text{NBI}}$	$I_p/B_T$	
6MW	0.8MA/0.4T	~4-5 shots
4MW	0.8MA/0.4T	~4-5 shots
6MW	1.1MA/0.55T	~4-5 shots
4MW	1.1MA/0.55T	~4-5 shots
Total:		16-20 shots

BES/reflectometers for mode measurements, high-k for fluctuations  
Li deposition for ELM-free operation