

Study of the correlation between GAE activity and electron transport

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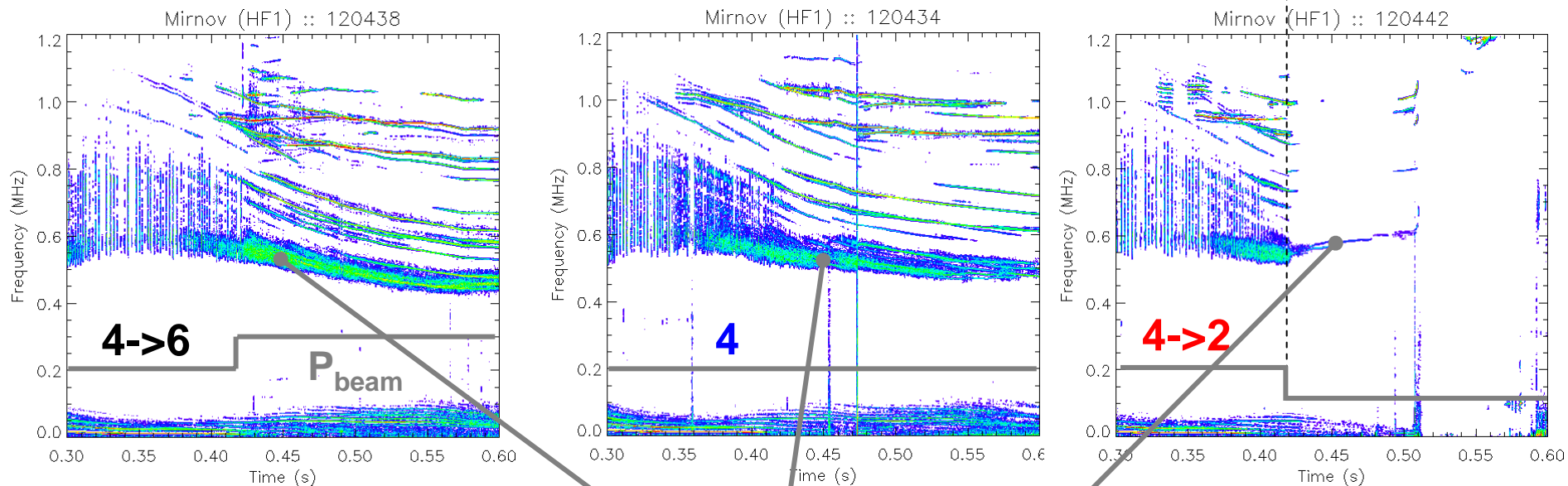
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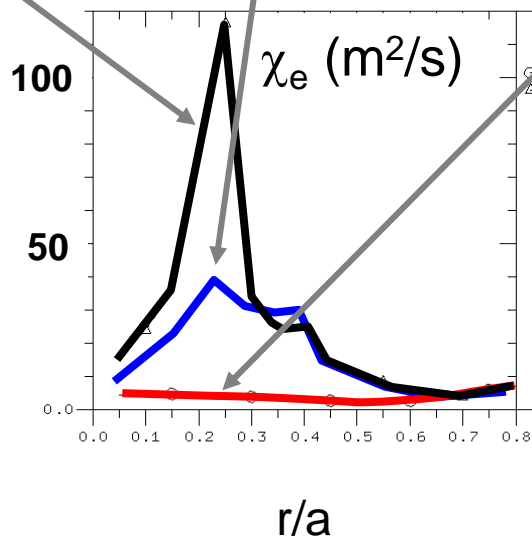
UCLA

Compelling signs for a GAE/electron transport connection

P_{beam} steps at fixed-q, 1 MA, 4.5 kG H-modes

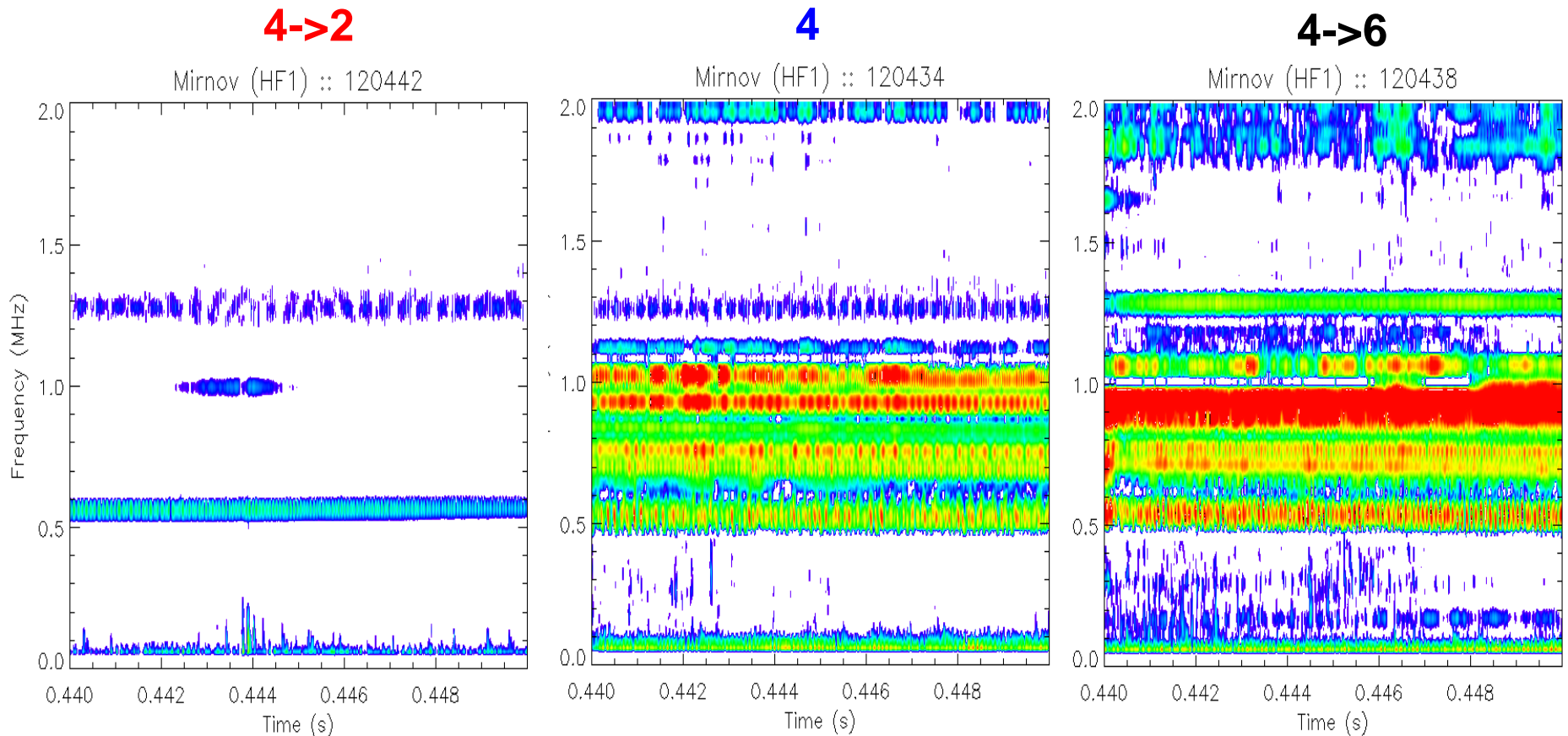


- Strong/weak GAEs correlate with high/low χ_e (flat/peaked T_e)
- Rapid χ_e increase above 2 MW suggests threshold



- GAE/ T_e peaking correlate also in L-mode
- Very similar plasmas without GAEs have higher central T_e

P_{beam} acts to increase GAE amplitude and 'coalesce' bursts

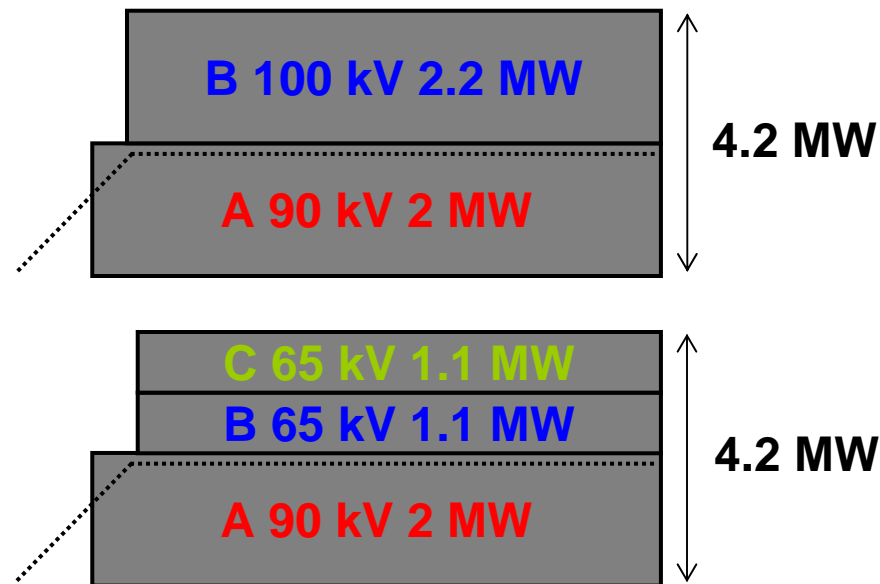


- P_{beam} threshold may be consistent with theory
- High q_0 (many rational- q) also seems to favor mode coalescence and high χ_e
- χ_e decreases with n_e in H-modes (trapped electrons? stochastic transport?)
- GAEs $\delta n/n \sim 10^{-3}$ may be in right range (S. Kubota, 'slow ramp' L-m, prelim.)

XP: Strengthen/document GAE/e⁻ transport connection

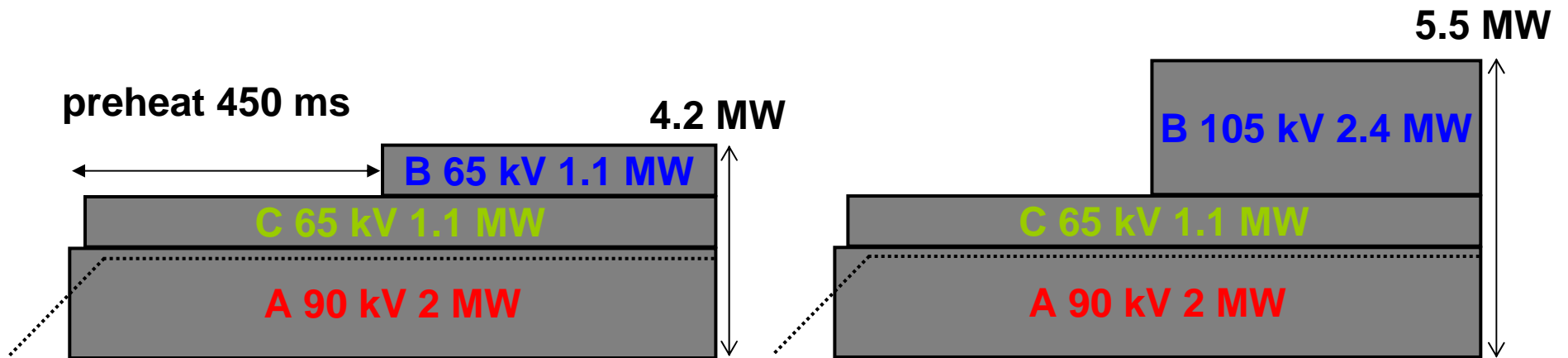
- Compare similar plasmas with/without GAEs
- Same q-profile (n_e , rotation) as much as possible
- Document with MPTS, CHERS, MSE, high-k, reflectometry, Neon injection

Scenario A: Compare H-modes with same P_{beam} but different V_{beam}



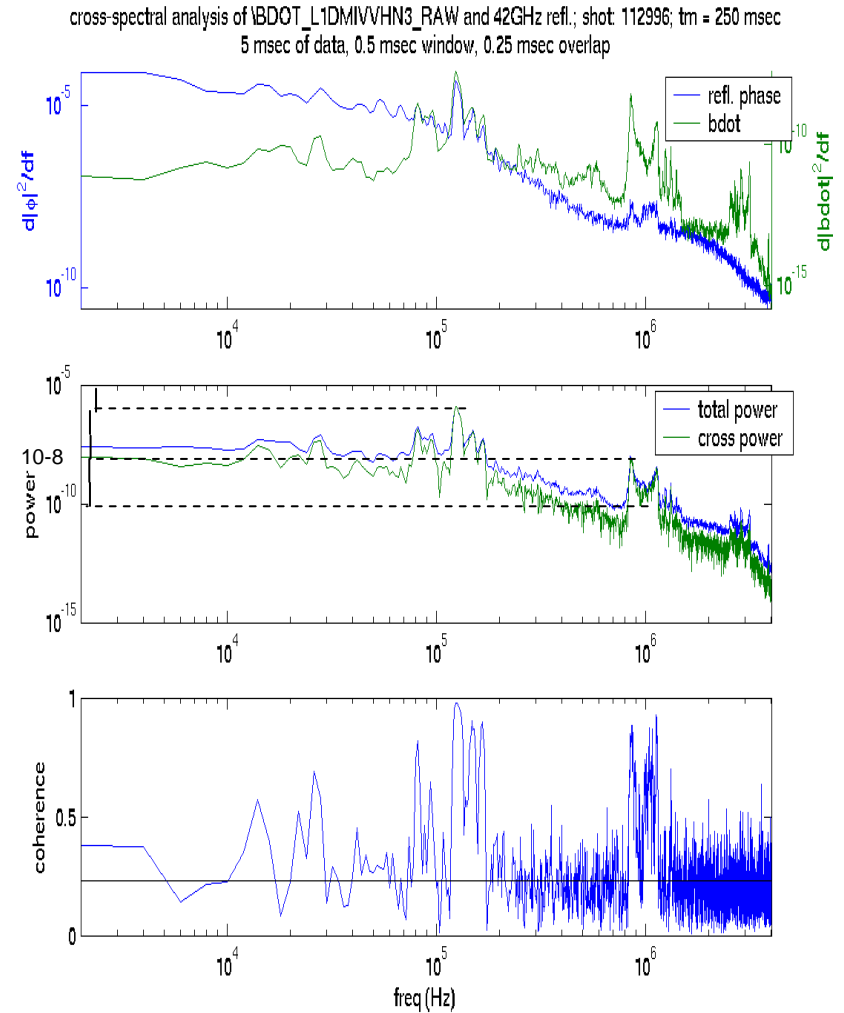
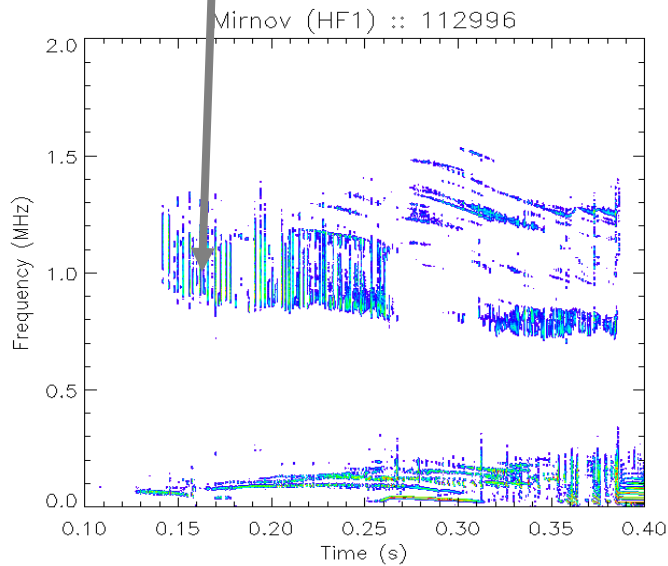
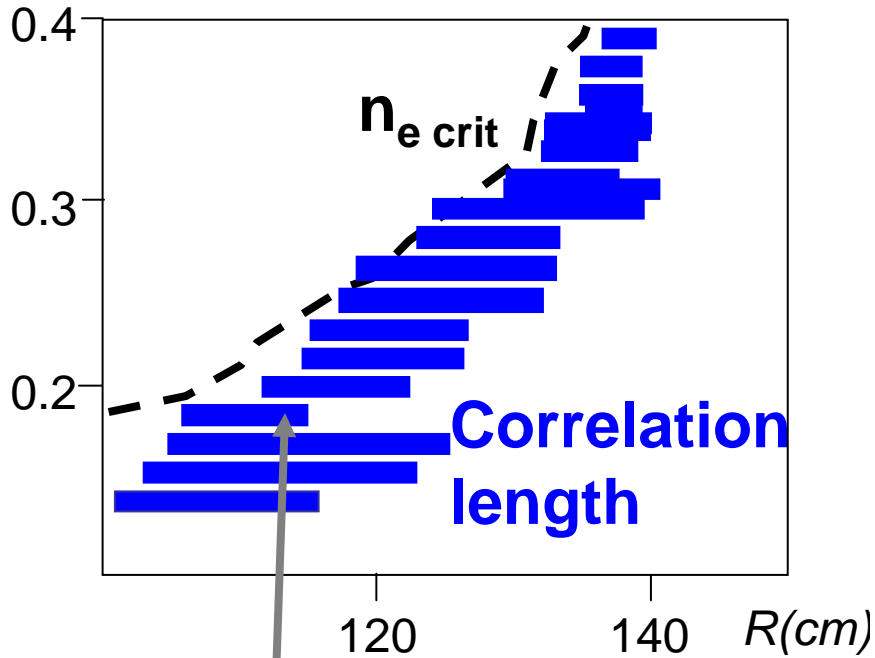
- GAEs 'turn-off' at low V_{beam} (E. Fredrickson)
- If at low V_{beam} q reverses, scan down I_p ramp rate to restore similar q
- Run in/a L-mode for reflectometry ? (more MHD, lower q_0 , $n_e < 3.1 \times 10^{13} \text{ cm}^{-3}$)

• **Scenario B:** P_{beam} step at increasing V_{beam}



- Make MHD quiescent 3 MW H-mode (A+C)
- ‘Freeze-in’ q-profile by preheating
- Step source B at increasing V_{beam} (60, 75, 90, 105 kV)
- Compare differences in electron transport using TRANSP
- Step both B+C (4.4-6.8 MW) ? Run in L-mode ?
- Combine with XP822 in one long run day?

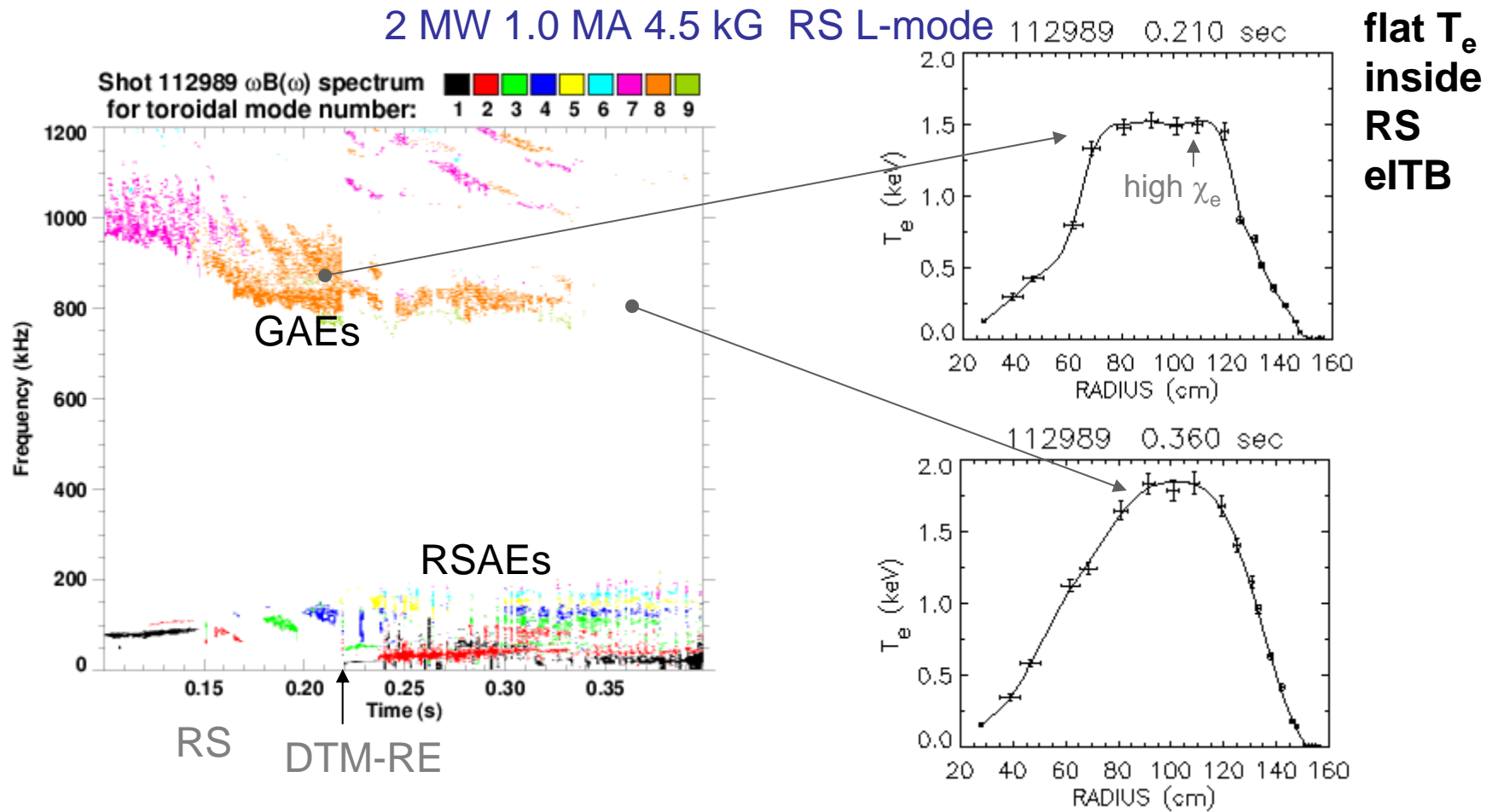
A slow-ramp L-mode could be used to 'calibrate' $\delta n/n$ vs. $\delta B/B$



S. Kubota '04

Slow ramp 2 MW 1 MA L-mode

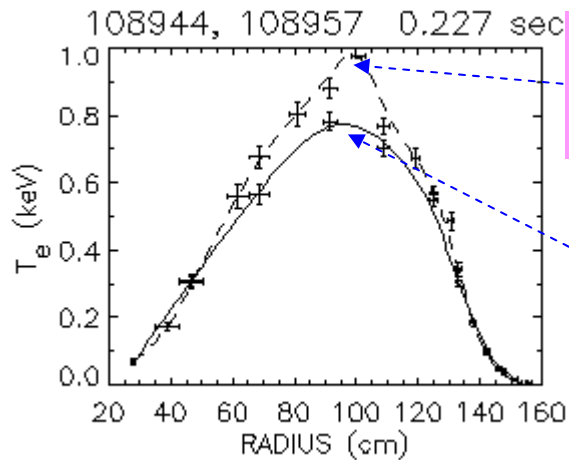
GAE decrease/ T_e peaking correlate also in L-modes



- RF appears to heat D-NBI plasmas only when no GAEs

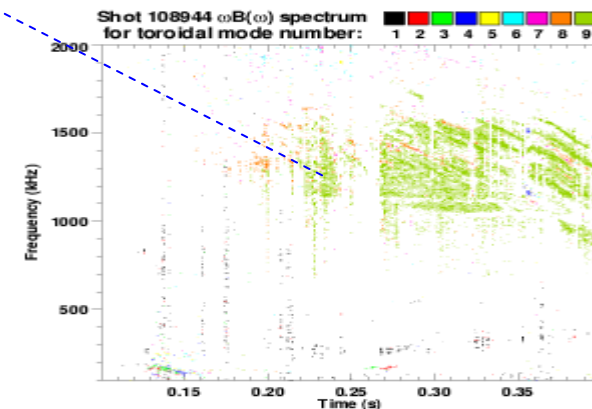
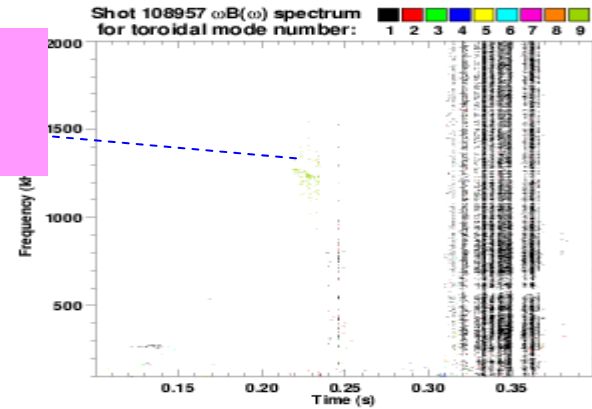
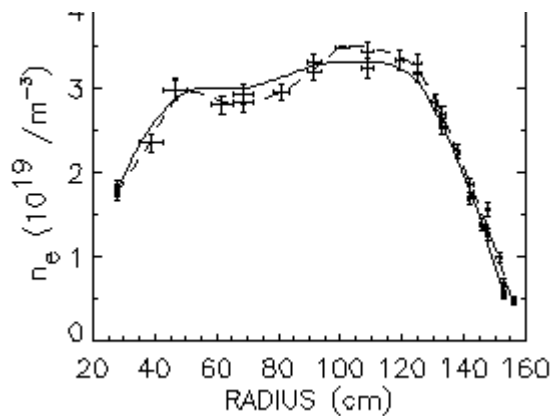
Very similar plasmas without GAEs have higher central T_e

1 MA, 4.5 kG L-modes (2002)



A+B+C 60 kV
2.4 MW

A 100 kV
2.2 MW



- μ -tearing possible link between GAEs and electrons (Stutman et al T&T/EP)
- GAE/trapped electron transport connection in ORBIT (N. Gorelenkov, prelim.)
- Possibly large implications for NHTX, beam-driven CTF, burning plasma