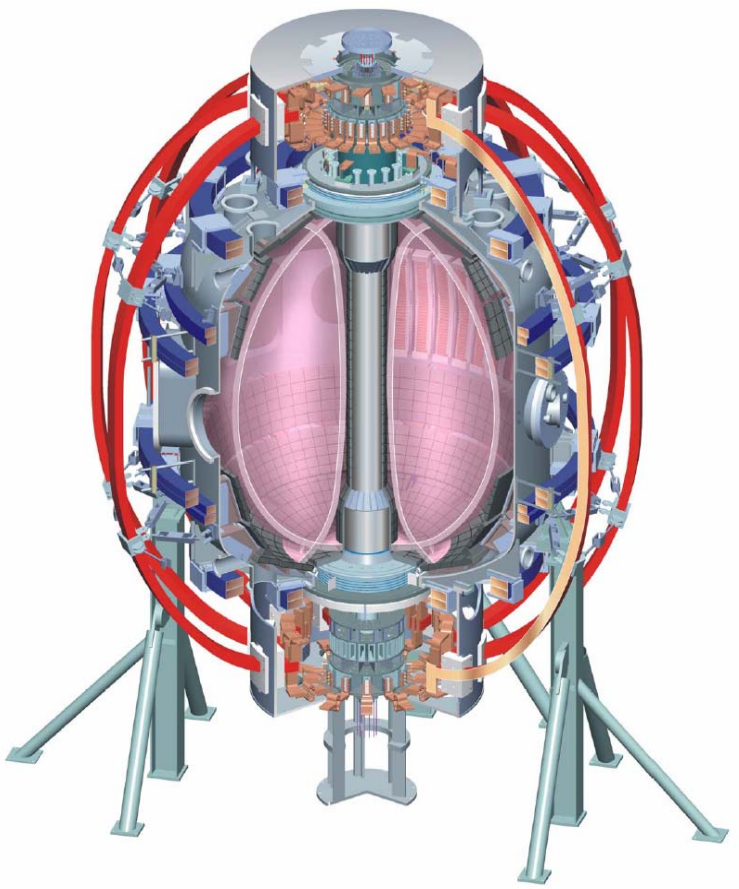


XP 734 - T_e Gradient and magnetic shear effects on Core Transport

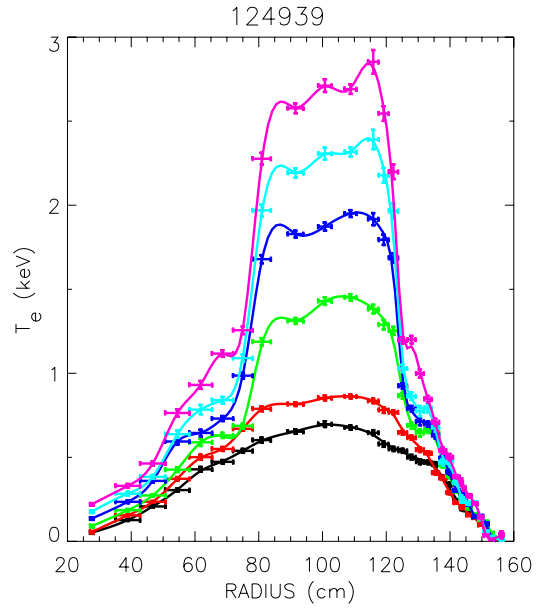
H.Yuh, F.M. Levinton, Nova Photonics
R.E. Bell, J.C. Hosea, B.P. LeBlanc, D.R. Smith, E. Mazzucato,H.K. Park, S.M. Kaye, PPPL
S. Kubota, UCLA

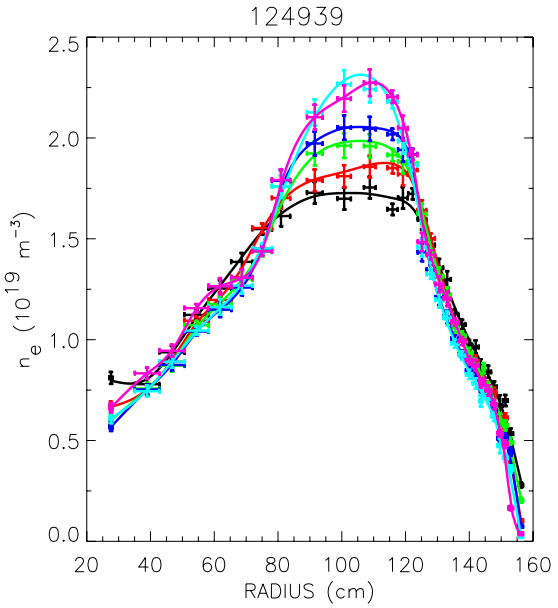
NOVA PHOTONICS

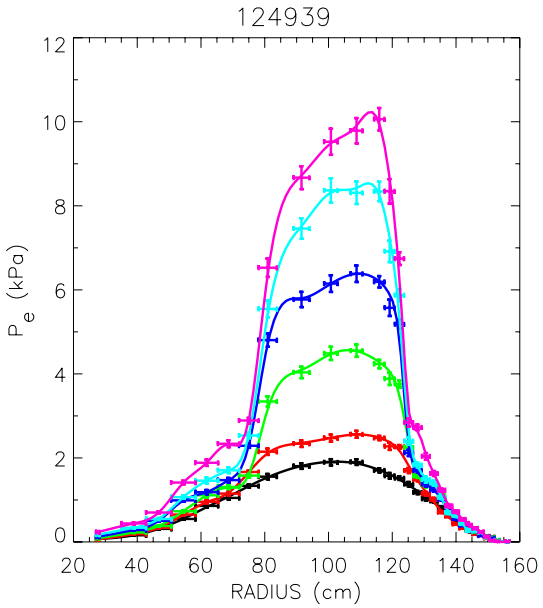
July 23, 2007
NSTX Results Review
Princeton, NJ

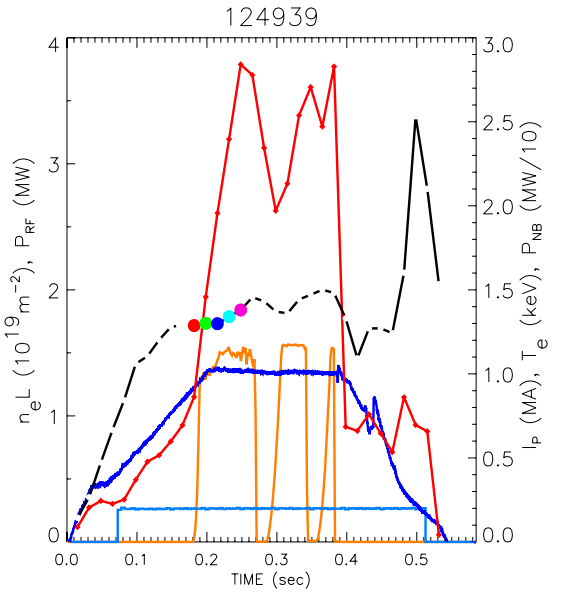
XP734 explores confinement in RS plasmas

- Continues previous RS work at 5.5kG. Adds HHFW to increase ∇Te
- Used beam timing to affect early current profile while scanning HHFW power
- Achieved strong ITB behavior in the electron and ion thermal channels
- Affects temperature more than density (HHFW not a particle source, NBI is)
- ITBs can occur with and without RF
- High-k data obtained at peak ∇Te region



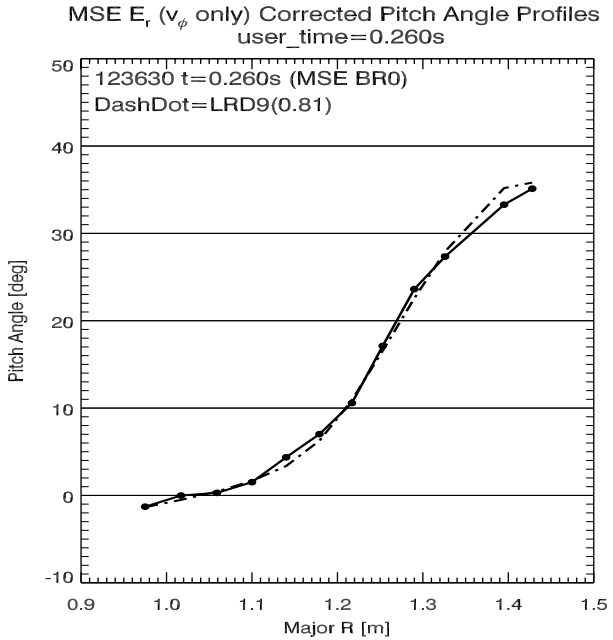


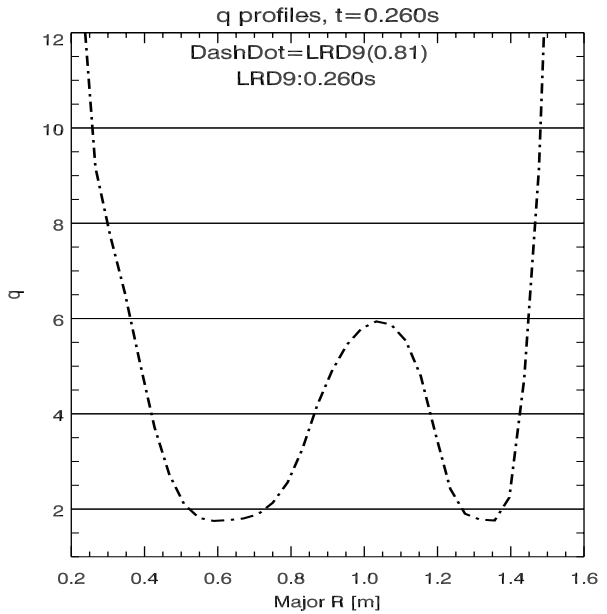


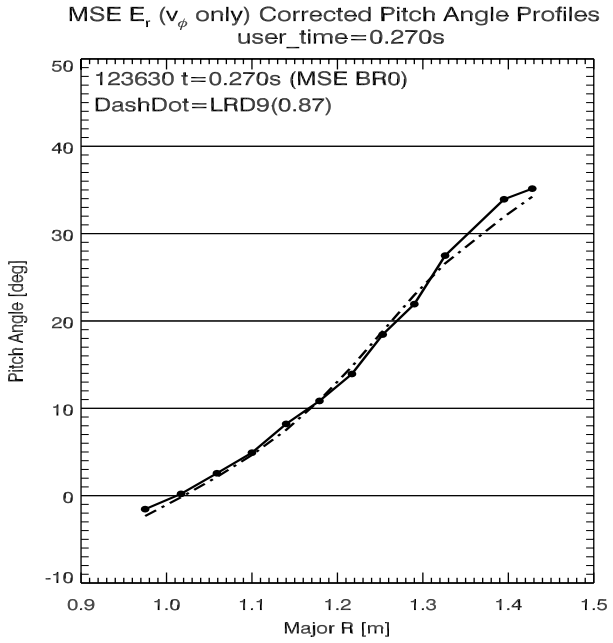


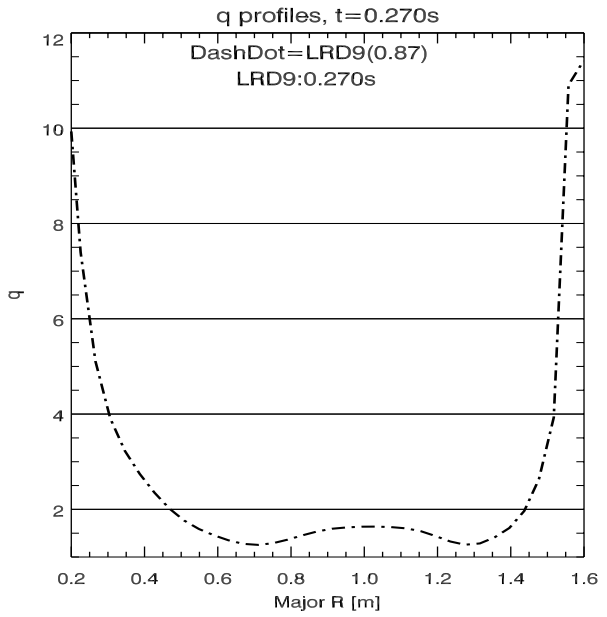
Good fits using LRDfit crucial for RS discharges

- LRDfit09 fits are run manually to good RS equilibria
- Good fits to MSE and MPTS profiles require substantial effort
- Starting point for accurate ŝ studies

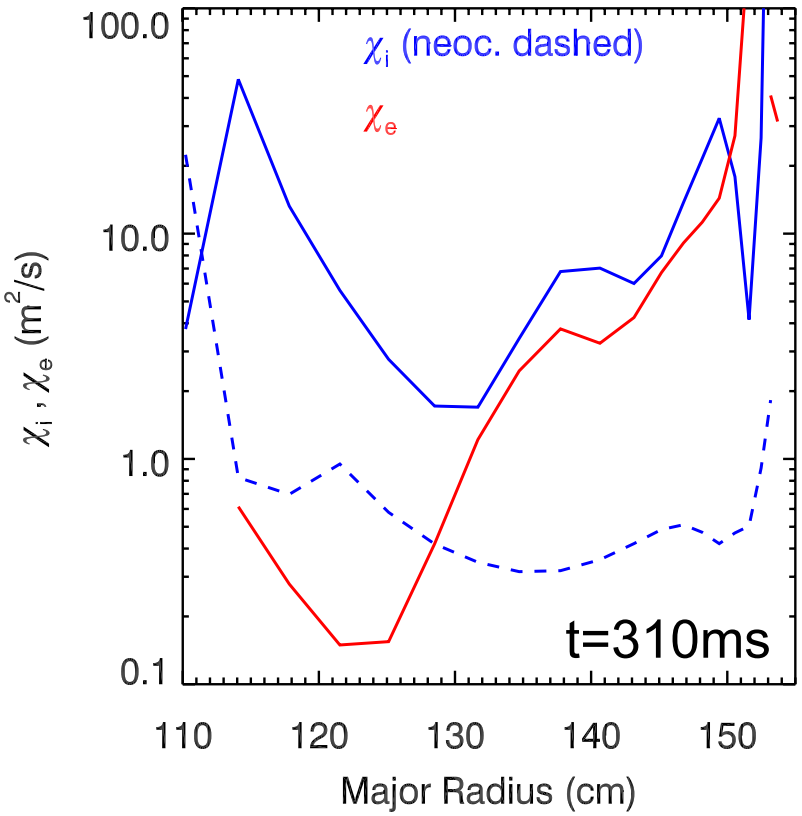


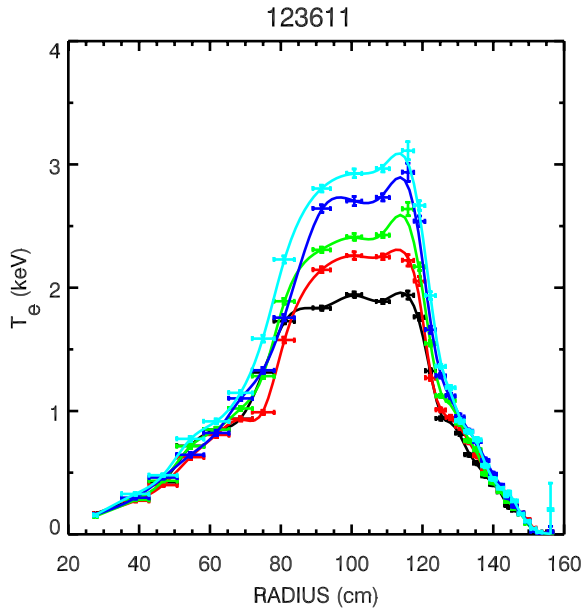


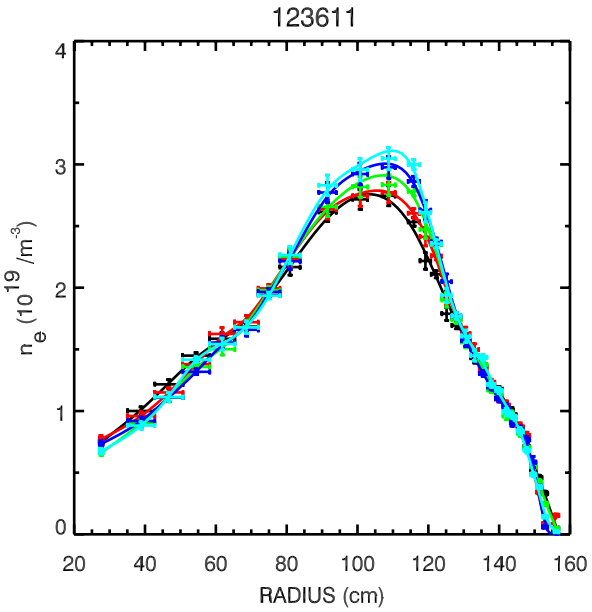


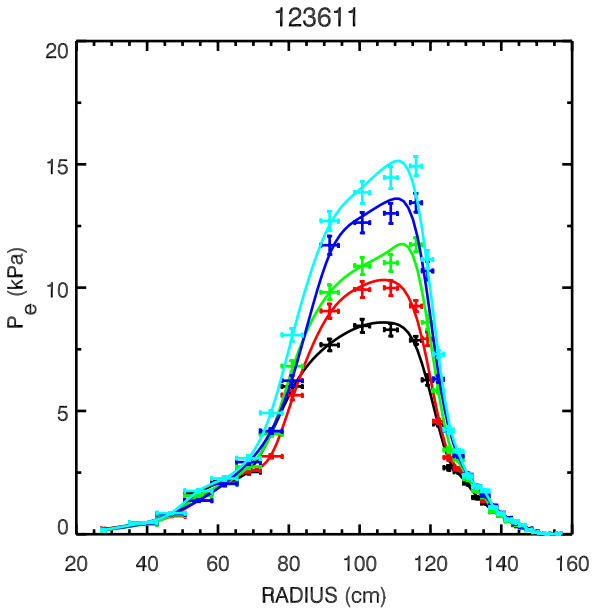


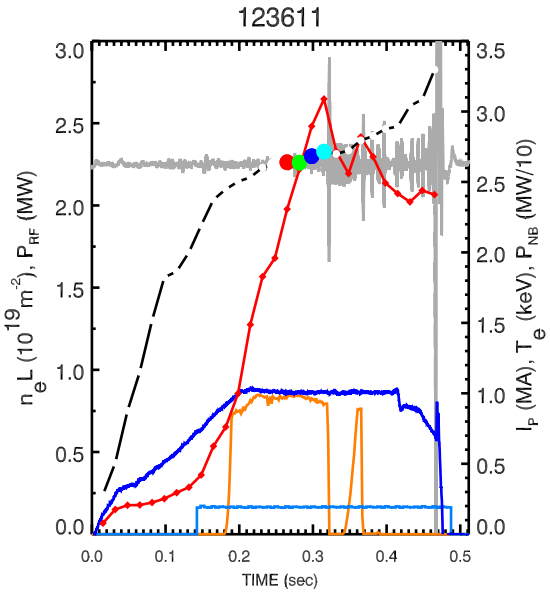
Preliminary TRANSP runs



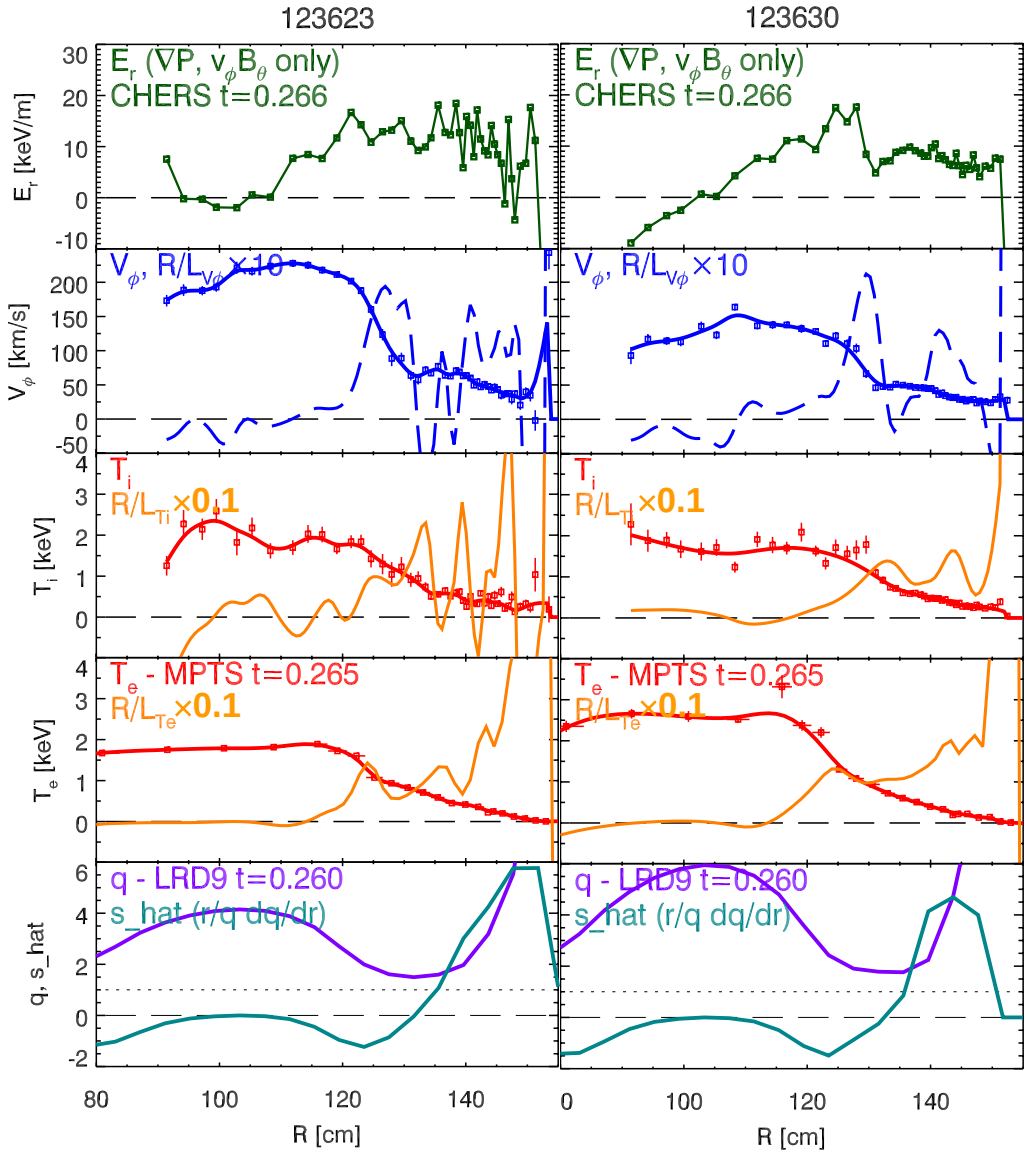


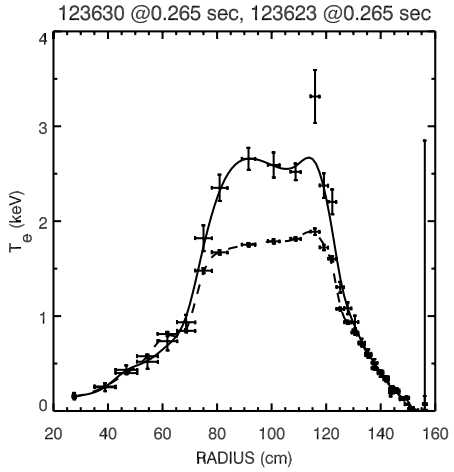


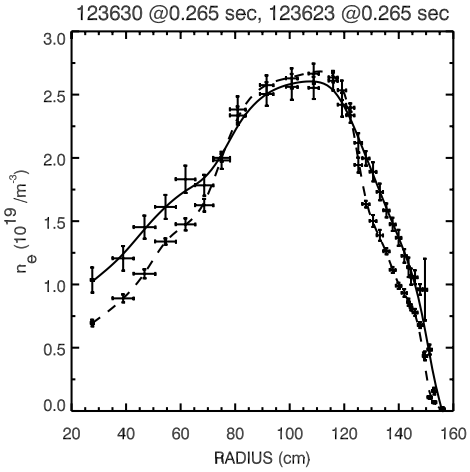


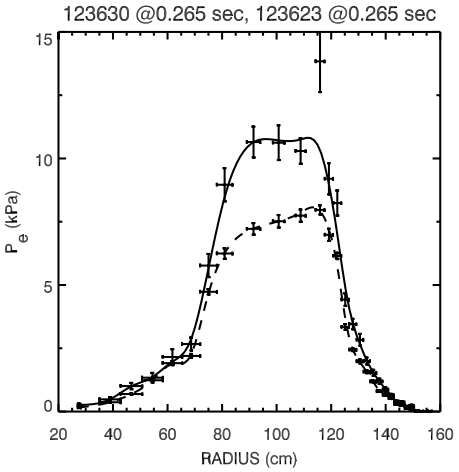


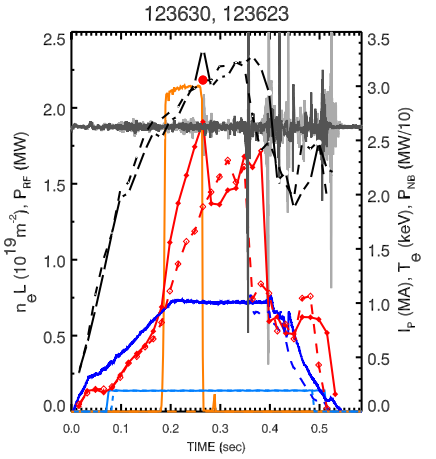
ITB can occur with and without RF heating





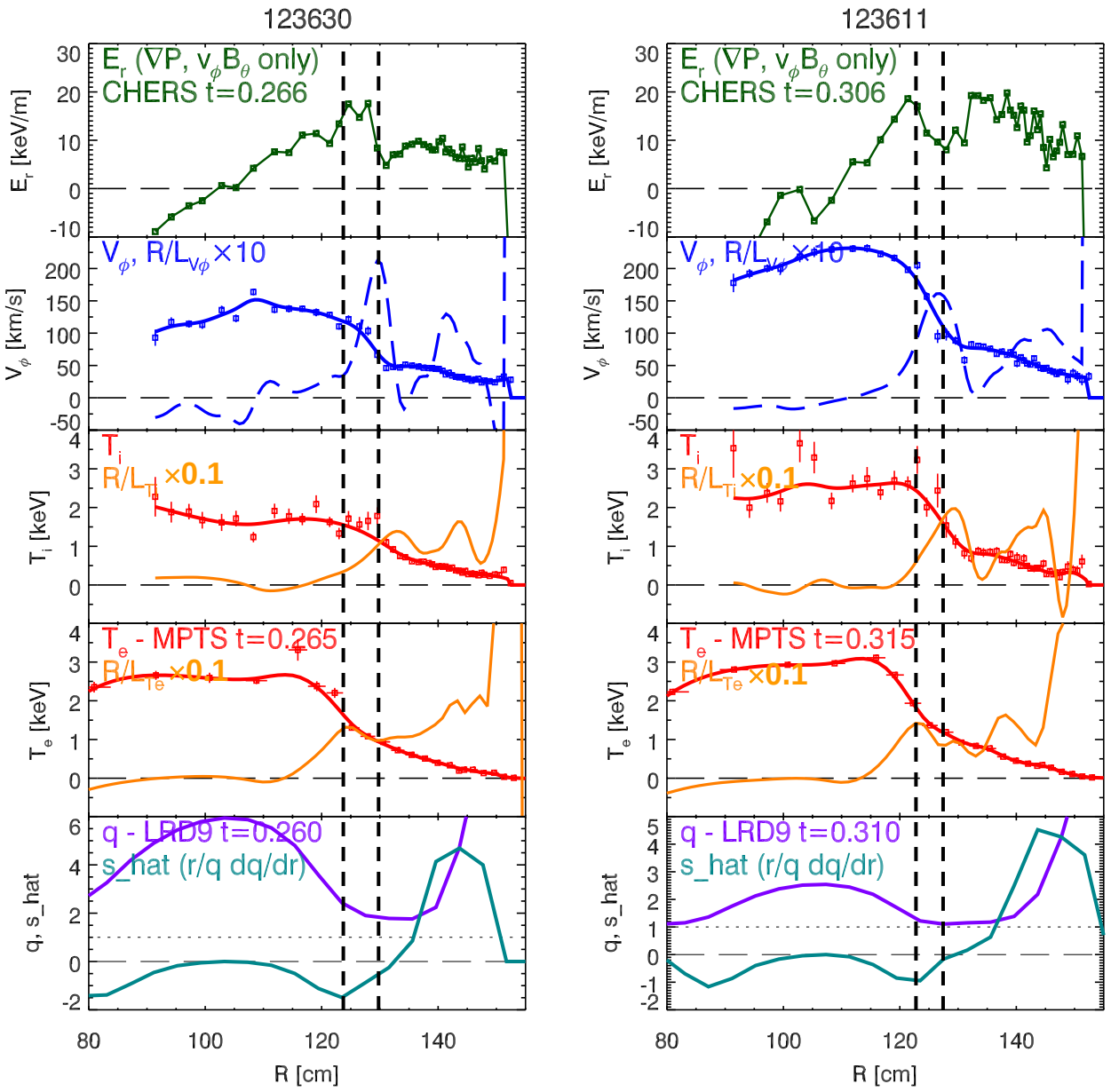






High ∇T_e, ∇T_i not necessarily in same region

- Region of highest ∇Te strongly correlates with minimum ŝ, but not ∇Ti
- ∇Ti correlates better with the region of maximum v_ϕ', but not perfectly
- Diagnostic misalignment possible but unlikely, 4 diagnostics involved



Outstanding questions, work to do

- Relationship between $\hat{s}$, E_r', χ_i, χ_e
- Does ∇T_e^{CRIT} exist? Is it a function of $\hat{s}$
  - GS2 γ sensitivity studies, analytical theory
  - Optimized shear on NSTX?
- Fast ion loss modelling, CURRAY need to be used properly in TRANSP.
- High-k, reflectometry, x-ray data
- Compare with menagerie of ITBs. T_e only, T_e/n_e, n_e, n_{imp}, n_i, momentum. Heating, particles, shear different
- Future: Confinement is too good in RS to avoid hitting β limit. Is "steady state" (>1 current relaxation time) discharge possible with reduced heating (similar to TFTR strategy). MSE-LIF necessary?