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SOL profile variation before and after LLD fill

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M.A. Jaworski, J. Kallman, et al.

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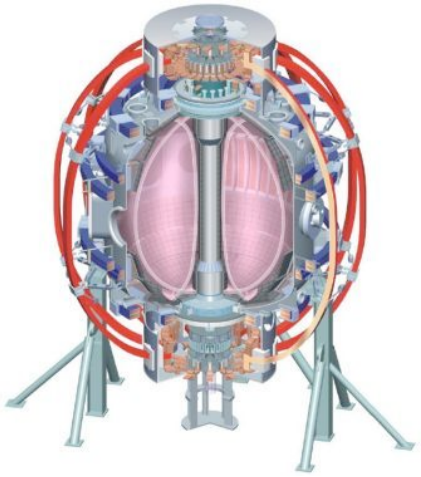
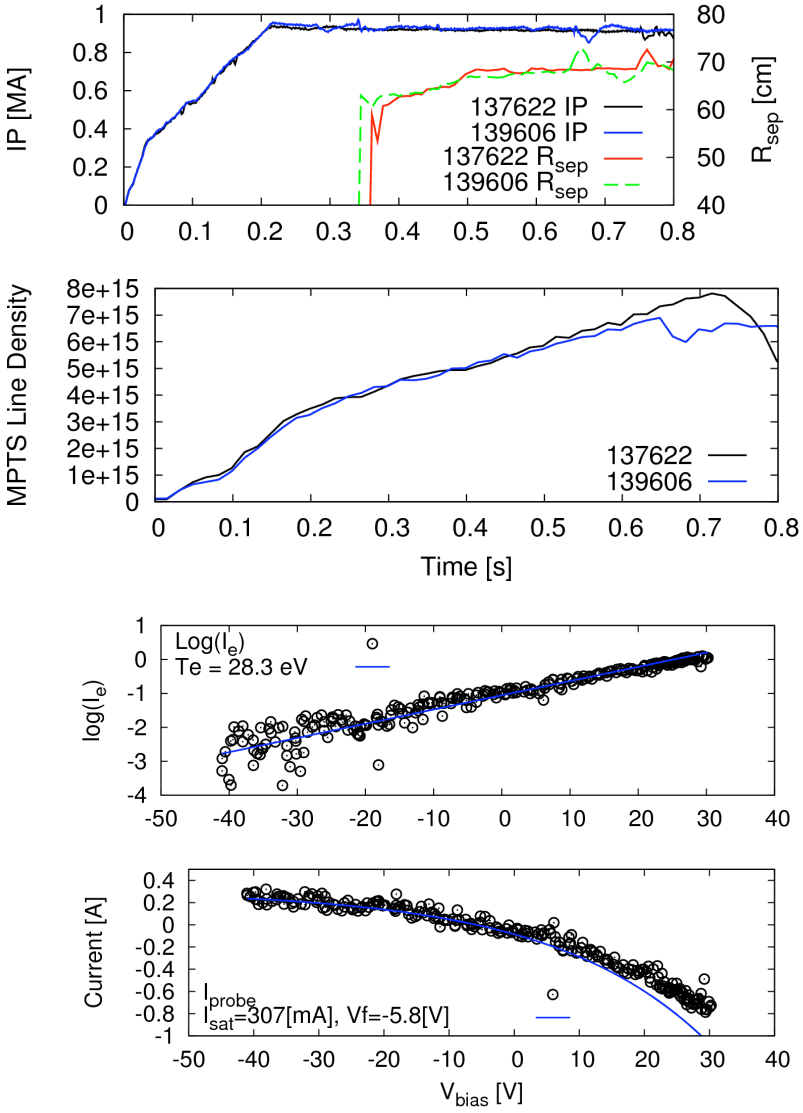
LLD Fest
August 23rd, 2010



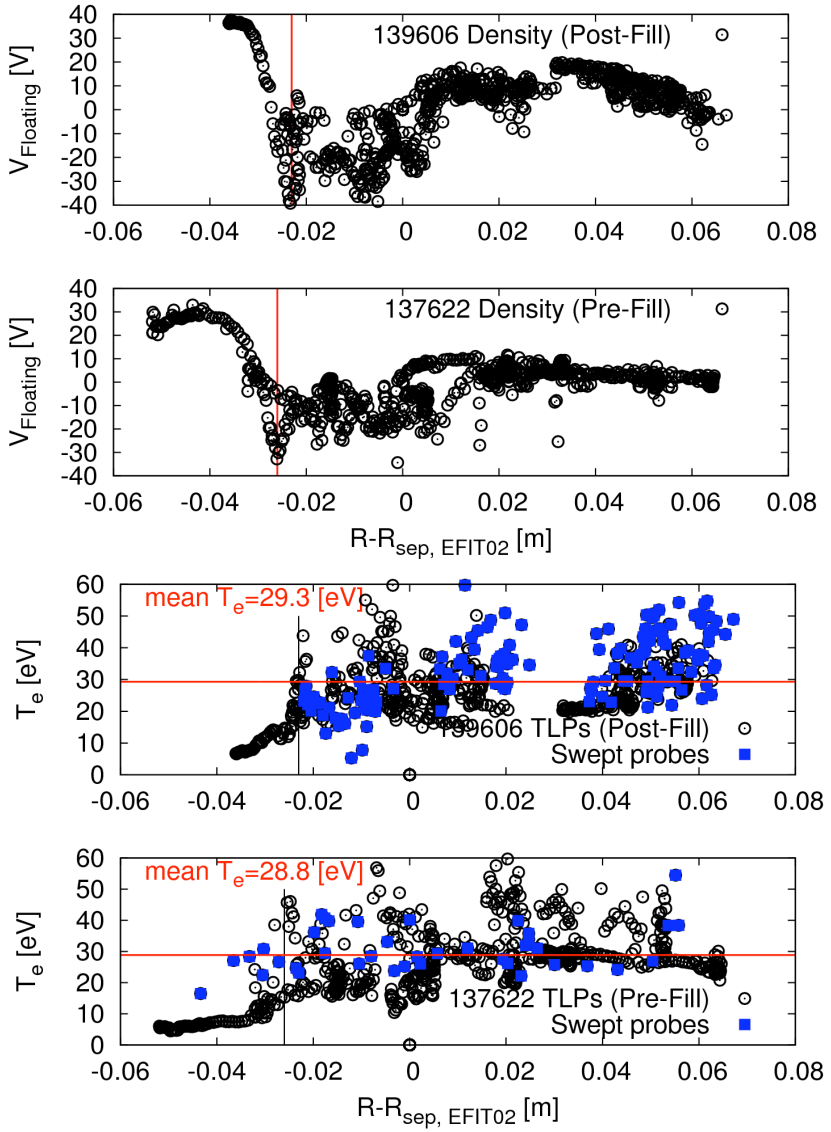
Comparison of 137622 and 139606

- Nearly identical discharges in XP1000 and XP1059
  - Matched Ip, Ne, strike-point control
  - 3MW NBI in 139606 vs. 2MW NBI in 137622
- Strike point sweep utilized to generate SOL profile
  - Representative IV trace shown at right (139606, 497ms)
  - Time slice from 460-515ms used in 137622
  - 460-500ms used in 139606
  - Time slices chosen to avoid blobs/ELMs in the discharge



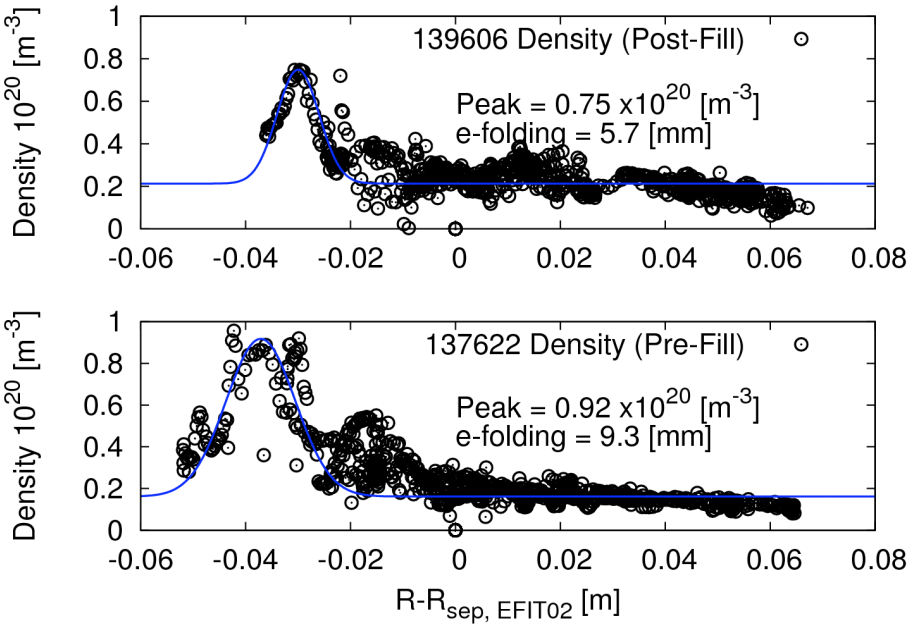
No significant variation in temperature

- Rsep taken from EFIT02
  - Magnetic reconstruction used as reference position
  - Position interpolated between EFIT time slices to obtain position at relevant probe times
- Probe data floating potential taken to indicate strike-point
  - Single and Triple data plotted together
  - Triple data averaged over 0.5ms
  - Vfloat previous used on DIII-D for this purpose (J. Watkins, JNM, **241-243** (1997))
- Mean electron temperature not significantly different
  - Mean taken outboard of Vfloat strike-pt
  - Non-saturating approximation used to interpret triple probe data (see M. Laux, CPP, 2004)

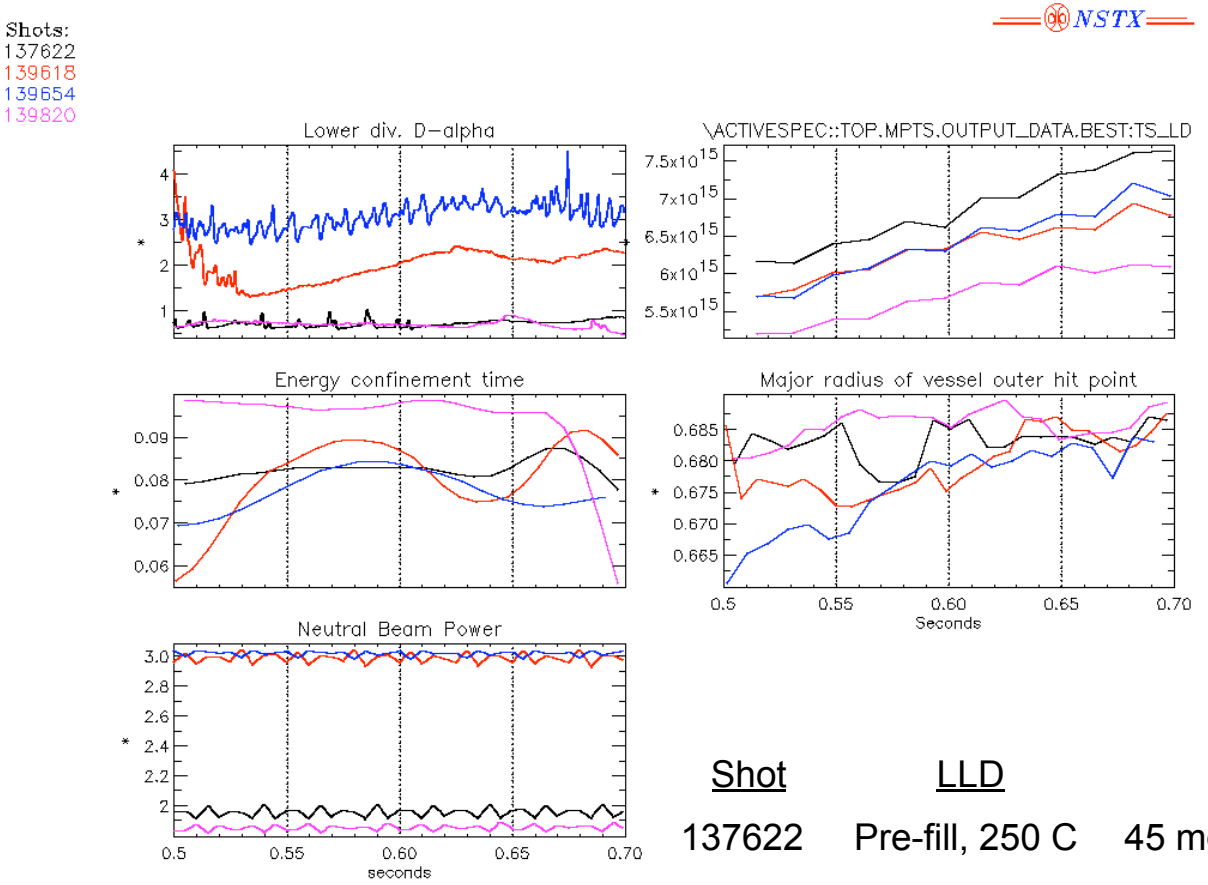


Significant variation in density profile

- Density calculation
  - Using nominal 5 degree angle of incidence due to magnetics ambiguity
  - Assumes Te=Ti
- Density profile variation observable in this comparison
  - Gaussian fit applied to get rough idea of profile, only applied to primary feature
  - Peak reduced by ~20%
  - Width reduced by ~40%



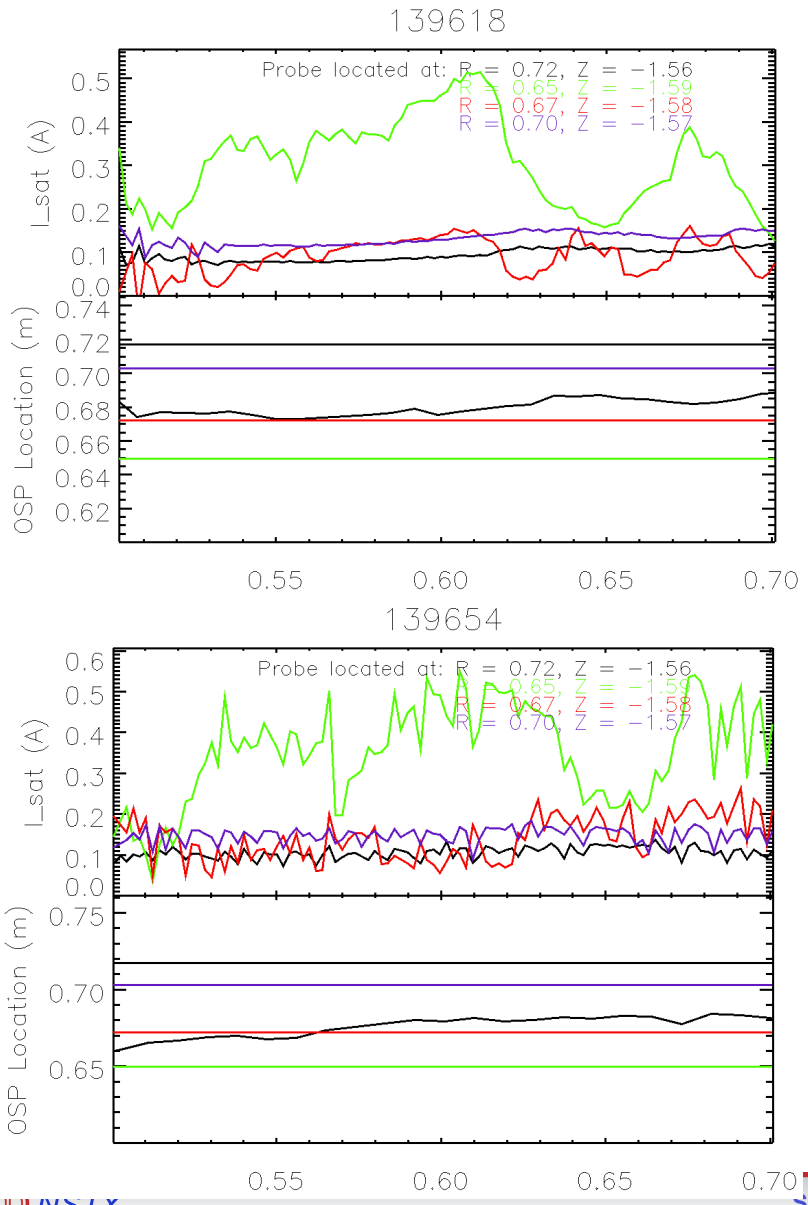
Shots examined for macroscopic parameter variation to examine further in probe data



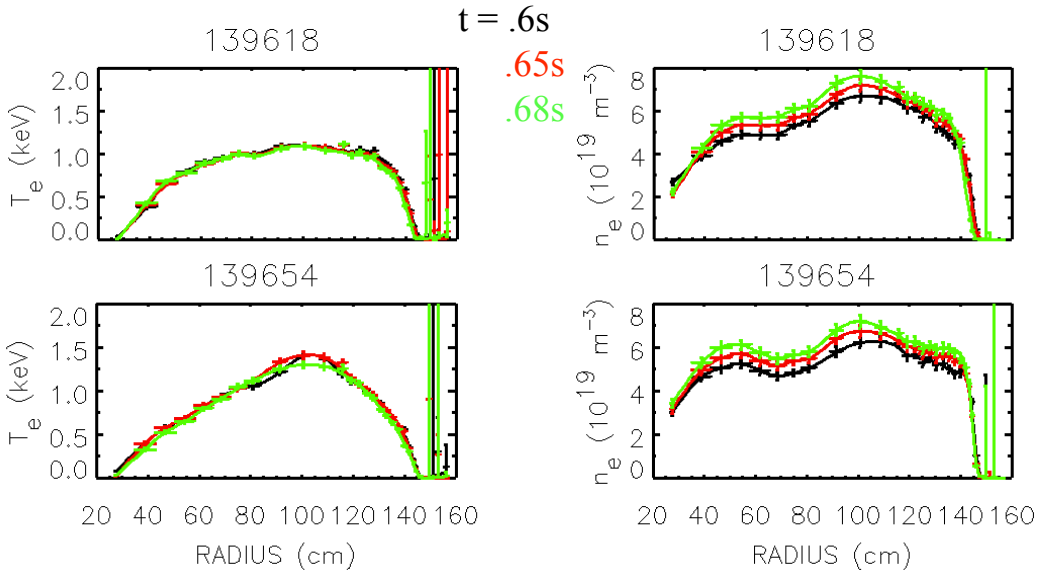
- Two main variations
  - 139618 vs 139654 – same NBI, density, different temp and LITER rate
  - 137622 vs 139820 – same NBI, D-alpha, different fill and temp
- Strike point in very similar location and controlled for all discharges

Shot	LLD	LITER
137622	Pre-fill, 250 C	45 mg/min / empty?
139618	175 C	20 mg/min
139654	70 C	none
139820	80 C	20 mg/min

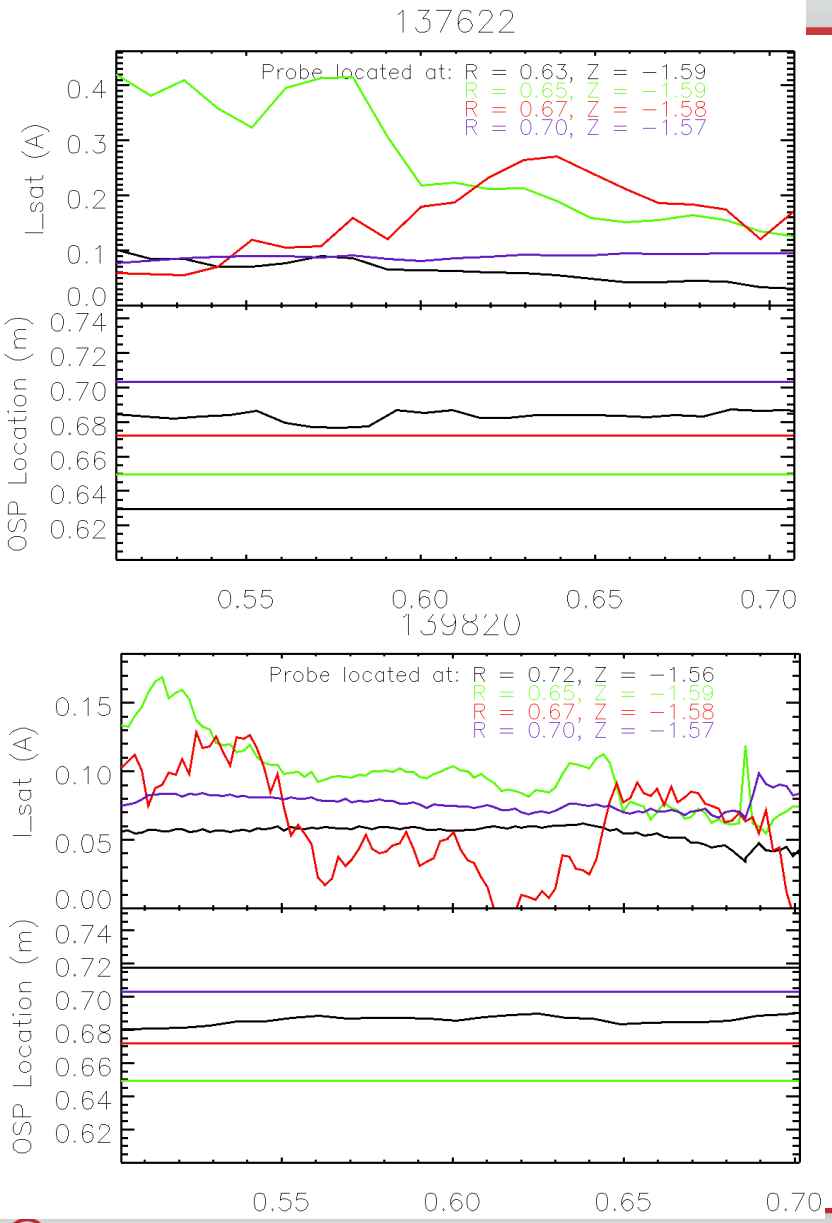
Single probe data shows behavior consistent with density pumpout at similar time (3 MW shots)



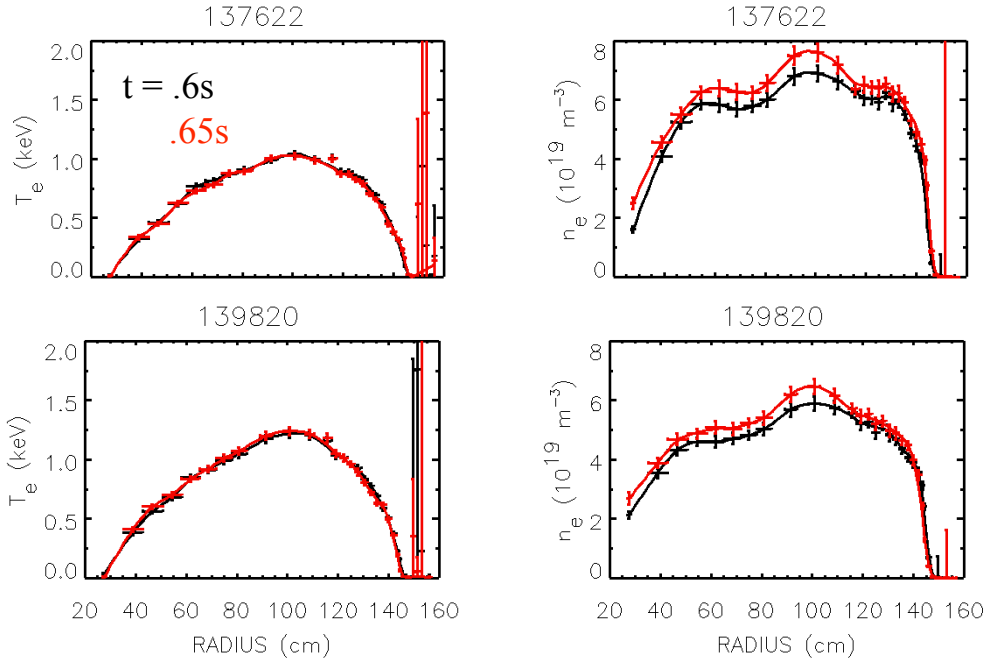
- Isat behavior for both shots is consistent, and shows drop around 620 ms
- Temperature remains constant over .6-.65s @ roughly 30 eV in both discharges
- Temperature profile much more peaked in 139654



Comparison of 2 MW shots



- Shots have same beam power, but cold, filled LLD has higher temperature and lower density
- Edge temperatures from LP array show ~20 ev in 137622 vs ~30 ev in 139820
  - density seems to drop by larger factor than that of the temperature rise?



Conclusions/open questions

- Density is generally lower in shots with LLD filled, regardless of temperature
  - role of LITER in density and temperature still not clear
  - hot, full, no-LITER shot sequence not performed for comparison
  - density 'pumpout' observed in that probe Isats drop over intervals even as core density is increasing
- Drop in density does not linearly correspond to rise in temperature; temperature profiles are also peaked – does not seem to agree with previous experience
  - highest confinement shot had lowest density and high fueling rate (1600 T on CS)
- Still necessary to compare with 0D or 2D models (thesis work)