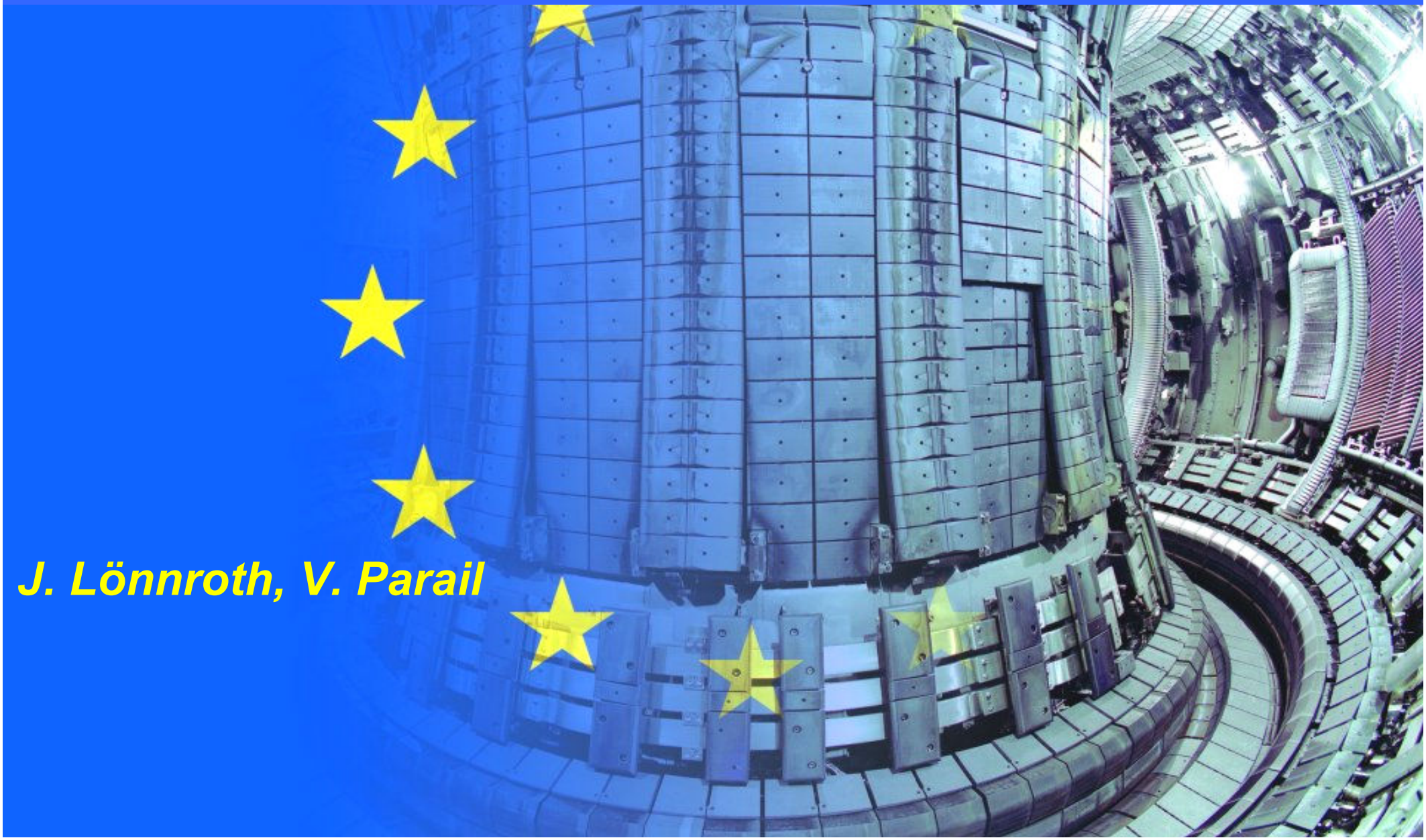
# Predictive modelling of current ramp-down in JET discharges



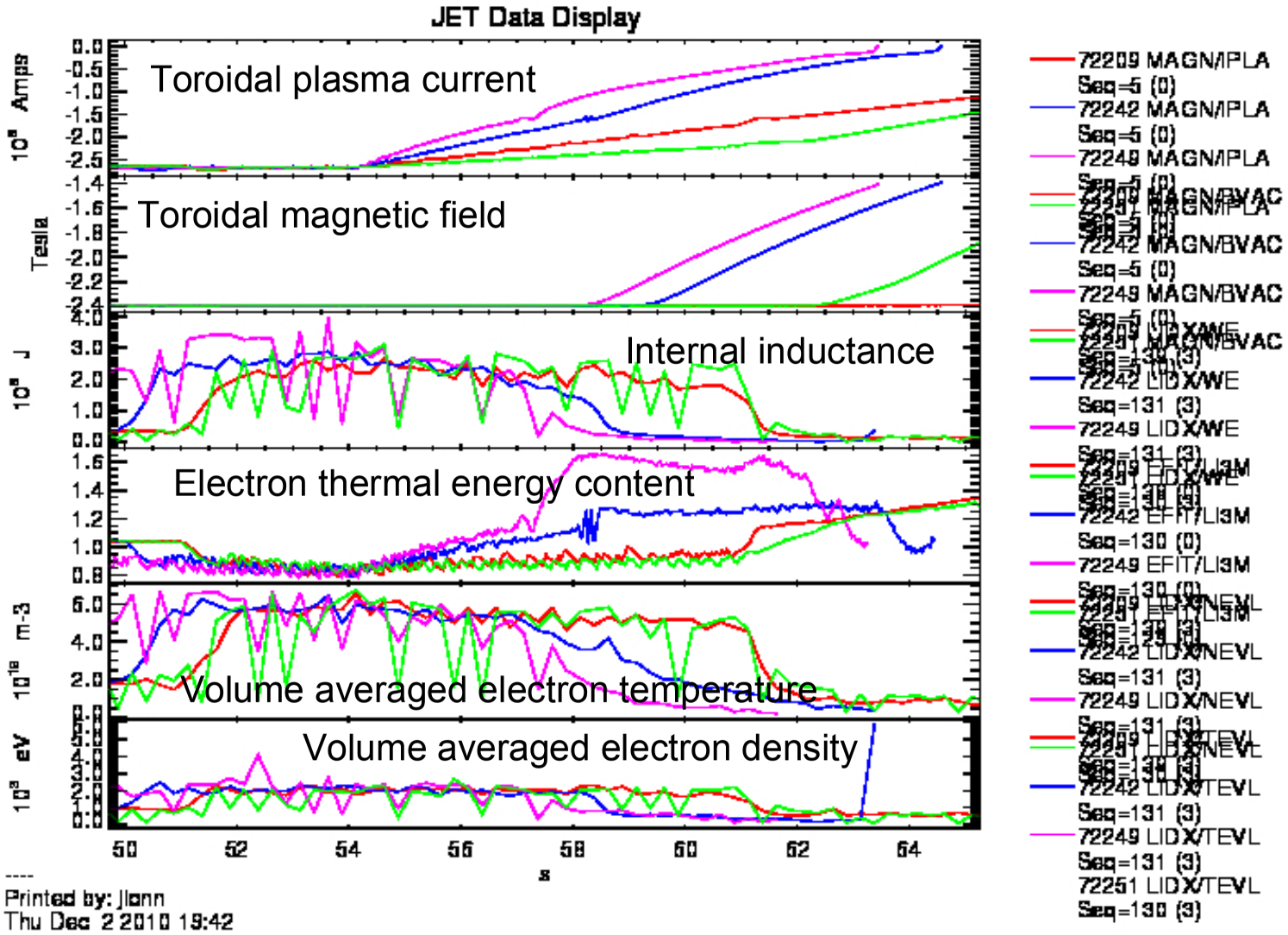
J. Lönnroth, V. Parail

# Modelling of H-L transition during current ramp-down

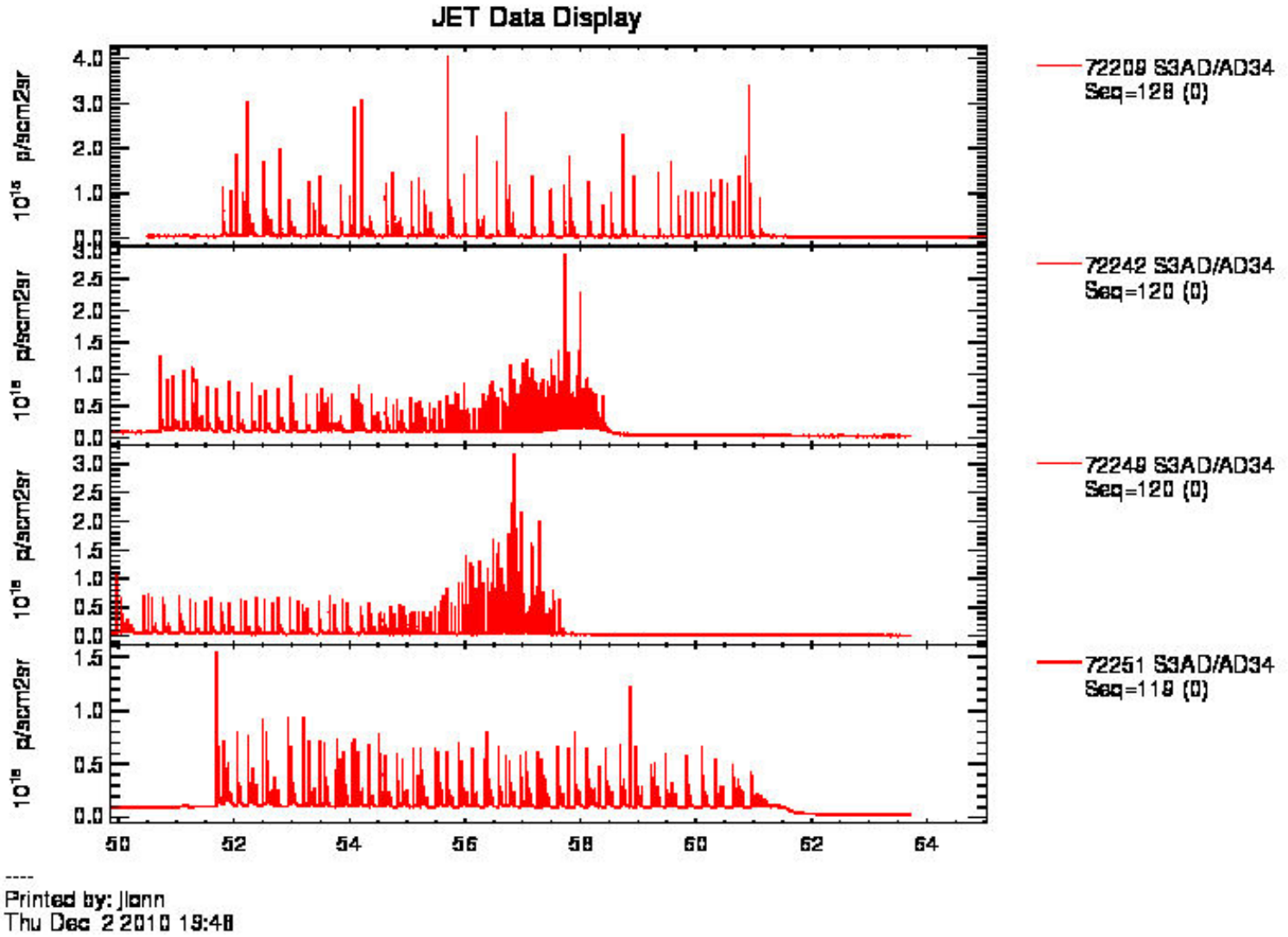
- The H-L transition in ITER is one of the most challenging parts of ITER operation;
- The reason is that the H-L transition leads to a very fast reduction in plasma energy content, exacerbated by the further loss of fusion power;
- This fast change in Wth pushes the plasma to the inner wall and might cause a disruption, if the PF system can not react promptly on this transition;
- Therefore, proper modelling of H-L transition in existing devices is very important for proper predictions of ITER operation.

# JET current ramp-down discharges

- JET current ramp-down discharges identified in the talk by I. Nunes have been studied.



# JET current ramp-down discharges (2)



# 72209 semi-predictive JETTO run

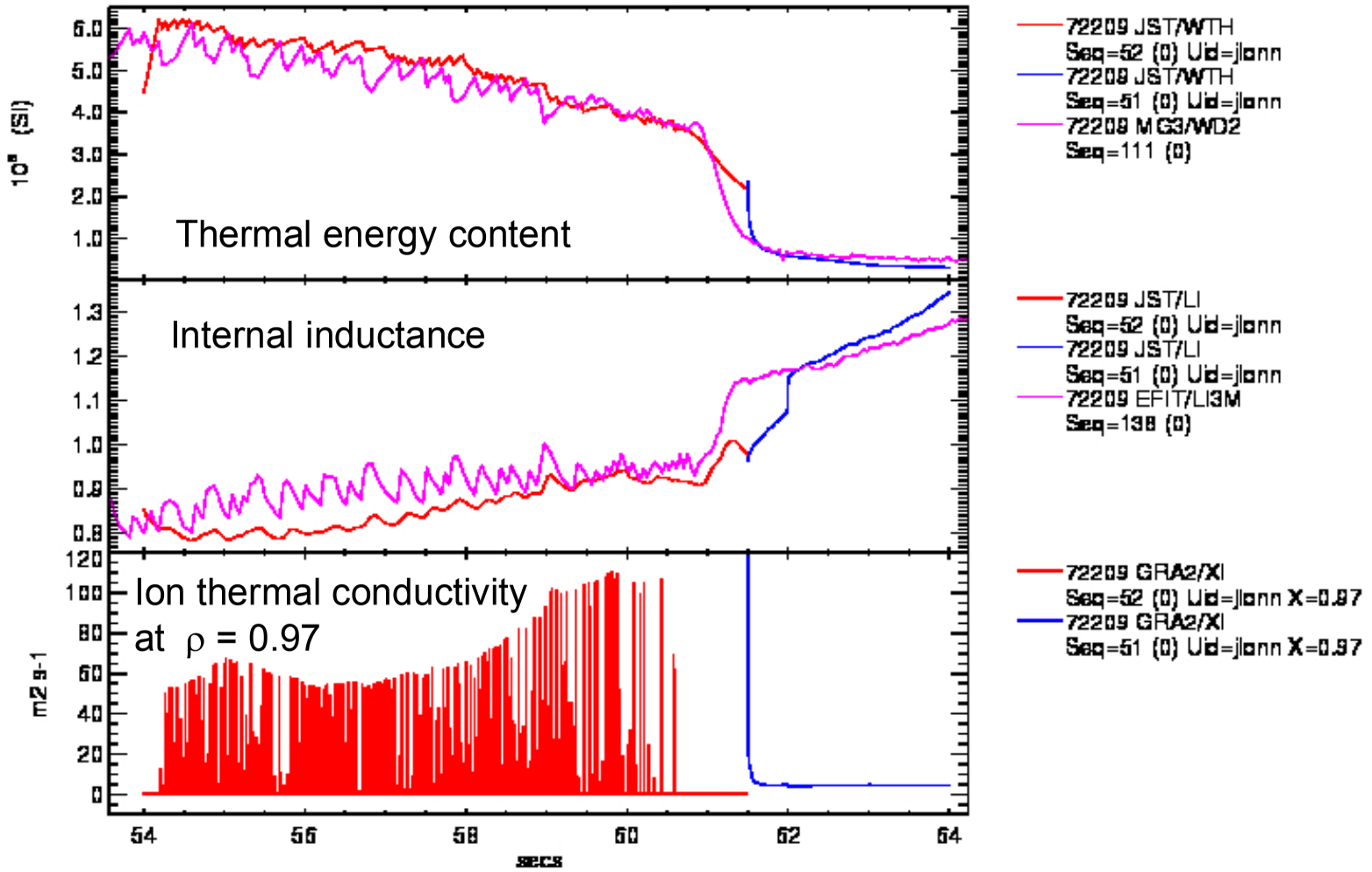
- Current and temperature predictive.
- Density interpretative.
- Bohm/gyro-Bohm transport model.

Colour code:

H-mode simulation

L-mode simulation

Experimental



# 72209 fully predictive JETTO run

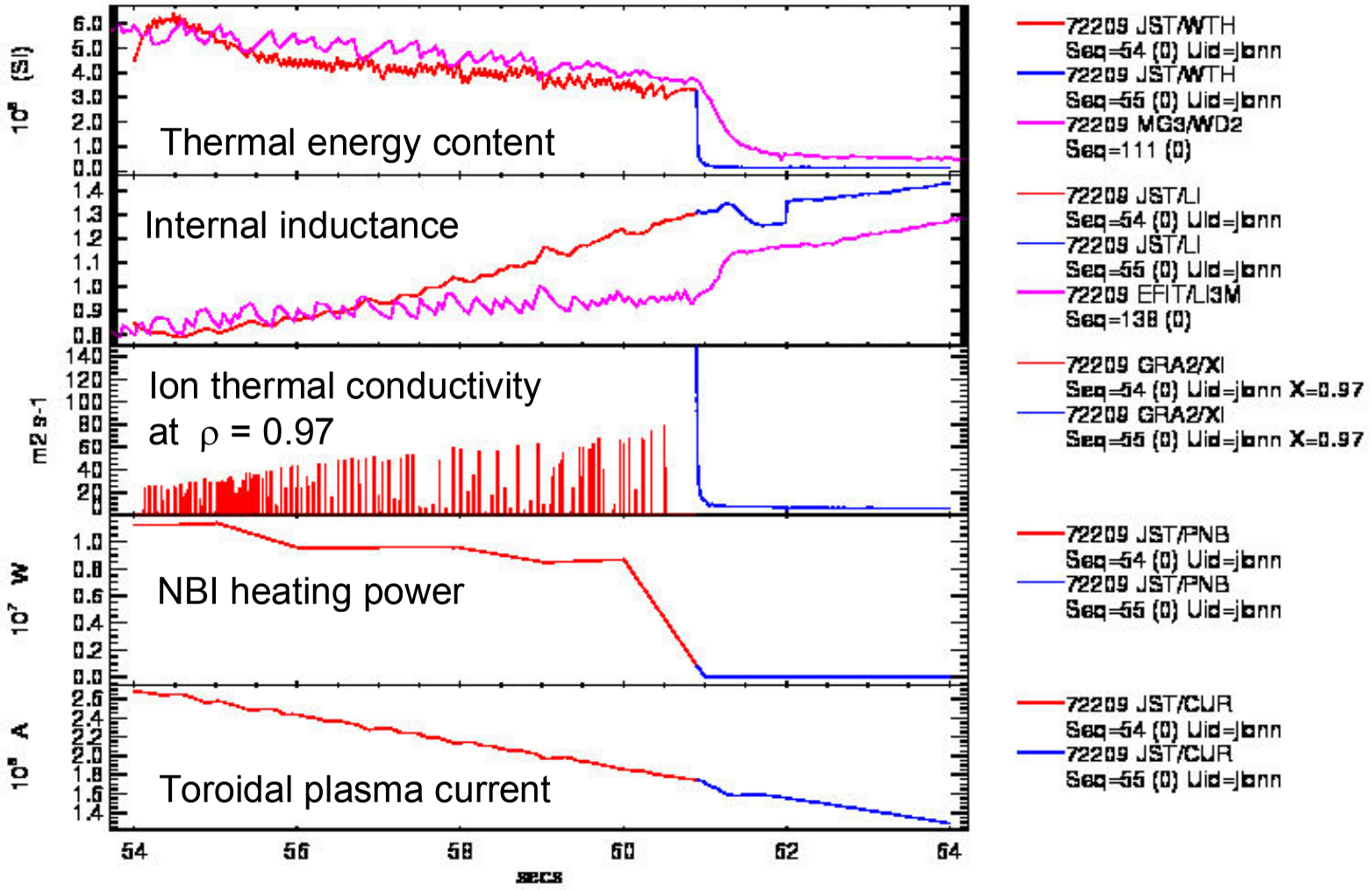
- Fully predictive.
- Bohm/gyro-Bohm transport model.

Colour code:

H-mode simulation

L-mode simulation

Experimental



# 72242 semi-predictive JETTO run

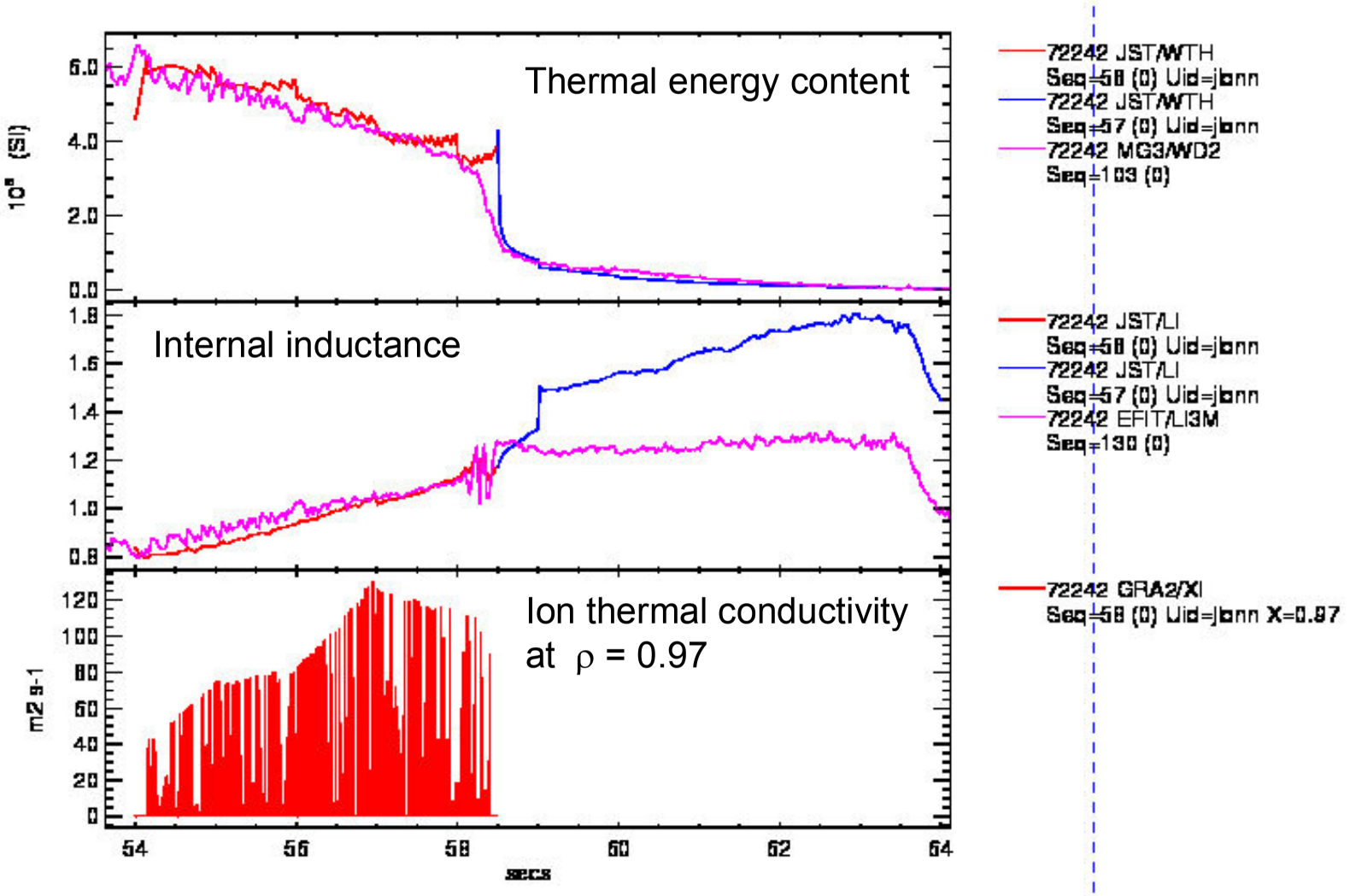
- Current and temperature predictive.
- Density interpretative.
- Bohm/gyro-Bohm transport model.

Colour code:

H-mode simulation

L-mode simulation

Experimental



# 72242 fully predictive JETTO run

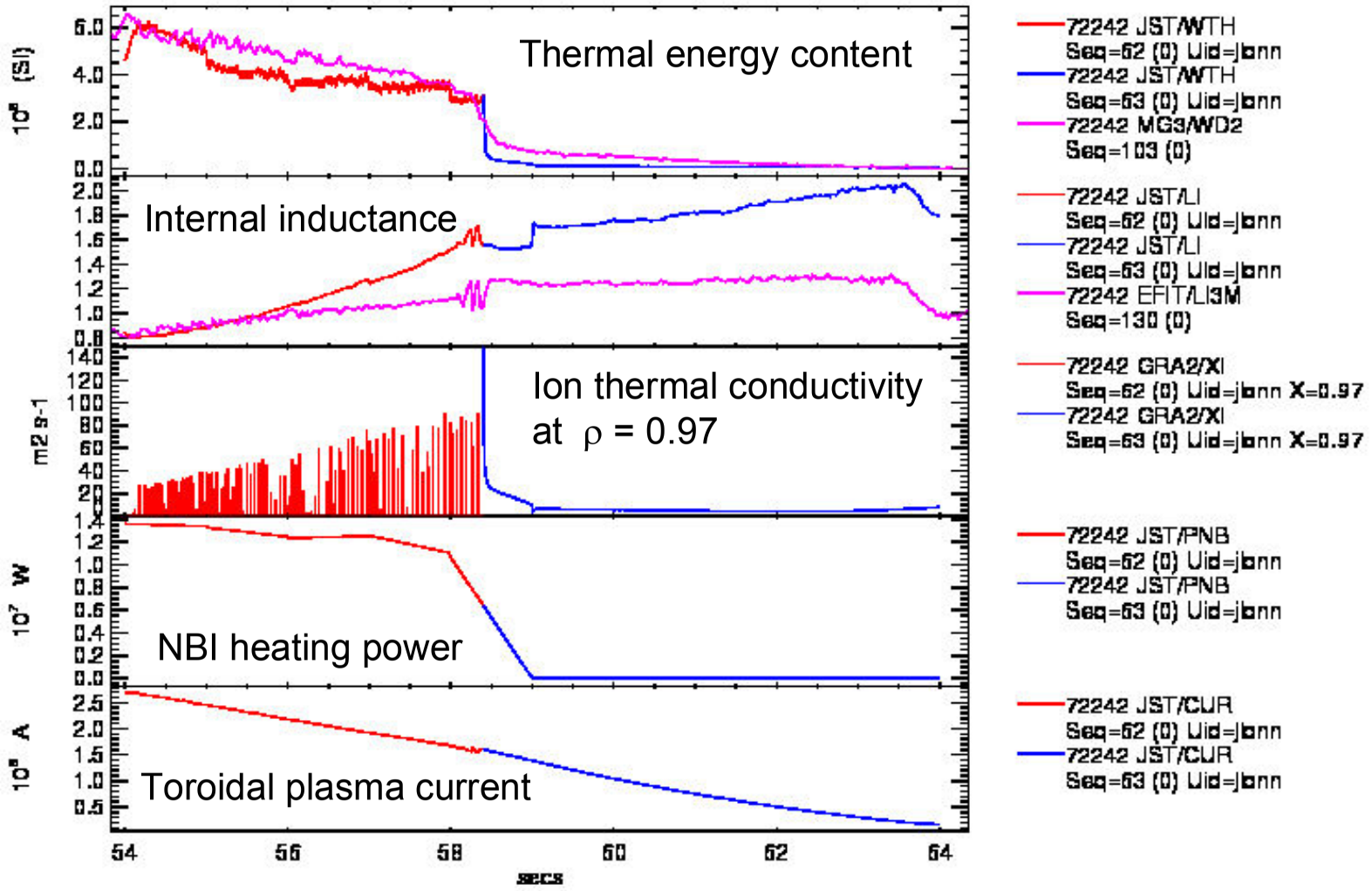
- Fully predictive.
- Bohm/gyro-Bohm transport model.

Colour code:

H-mode simulation

L-mode simulation

Experimental



# 72249 semi-predictive JETTO run

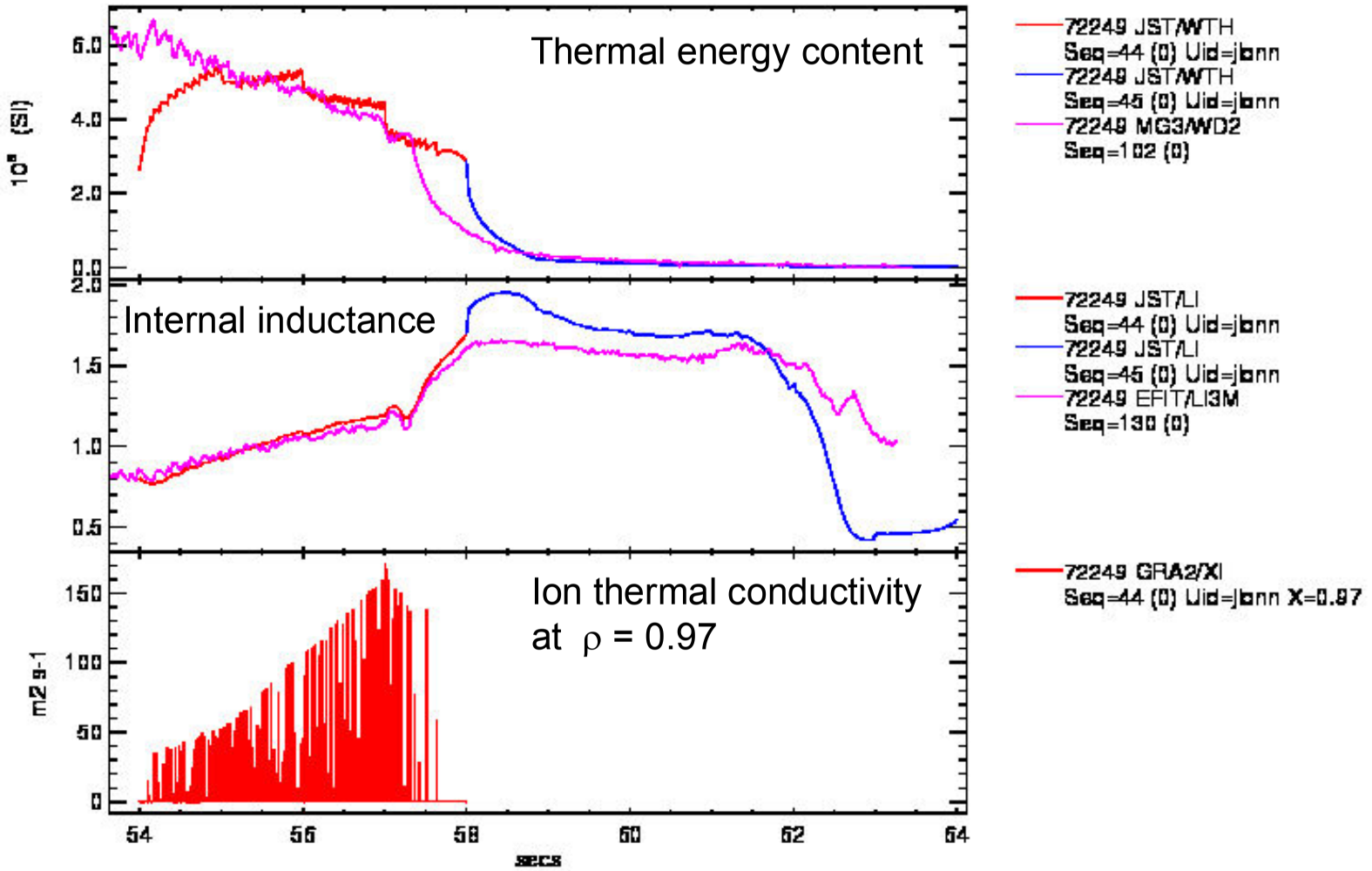
- Current and temperature predictive.
- Density interpretative.
- Bohm/gyro-Bohm transport model.

Colour code:

H-mode simulation

L-mode simulation

Experimental



# 72249 fully predictive JETTO run

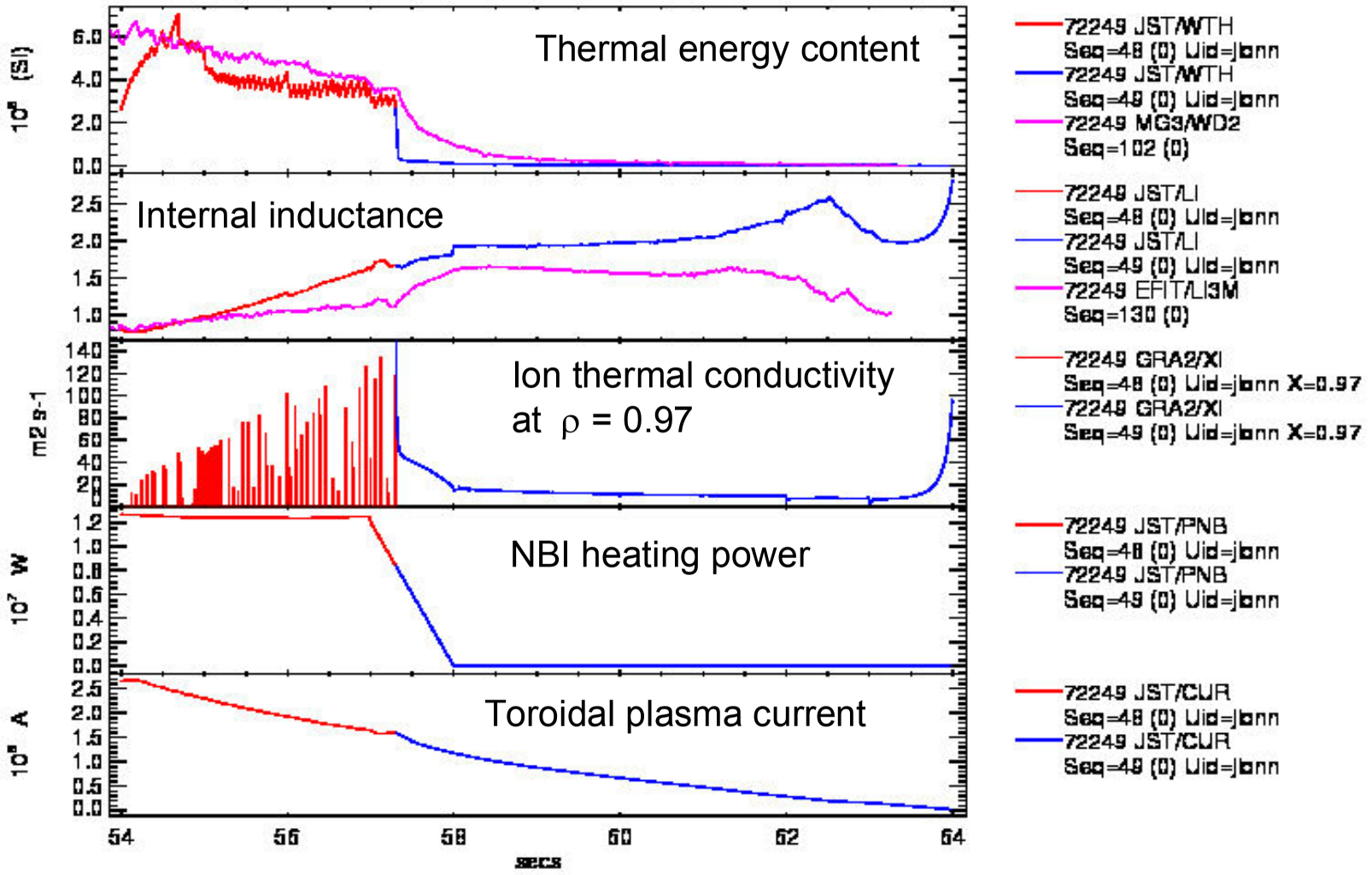
- Fully predictive.
- Bohm/gyro-Bohm transport model.

Colour code:

H-mode simulation

L-mode simulation

Experimental



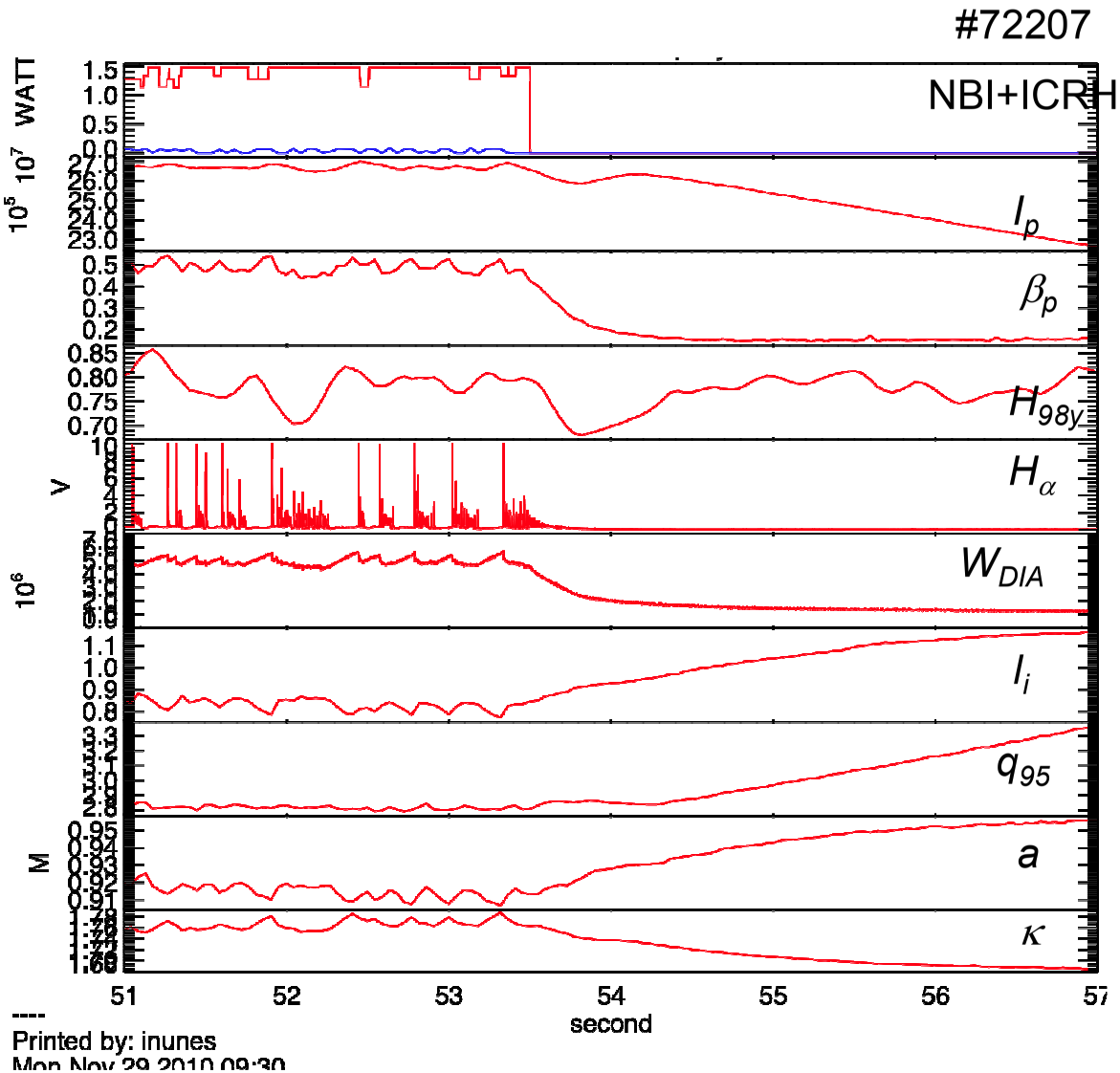
# What if H-mode is lost during flat top?

V. Parail

- H-L transition at the end of the current flat top…

- $dI_p/dt$=0.14MA/s
- $W_{DIA}$ = 4.6MJ
  - $\Delta W$(0.1s) = 3.655MJ
  - $\Delta W$(1.8s) = 1.386MJ

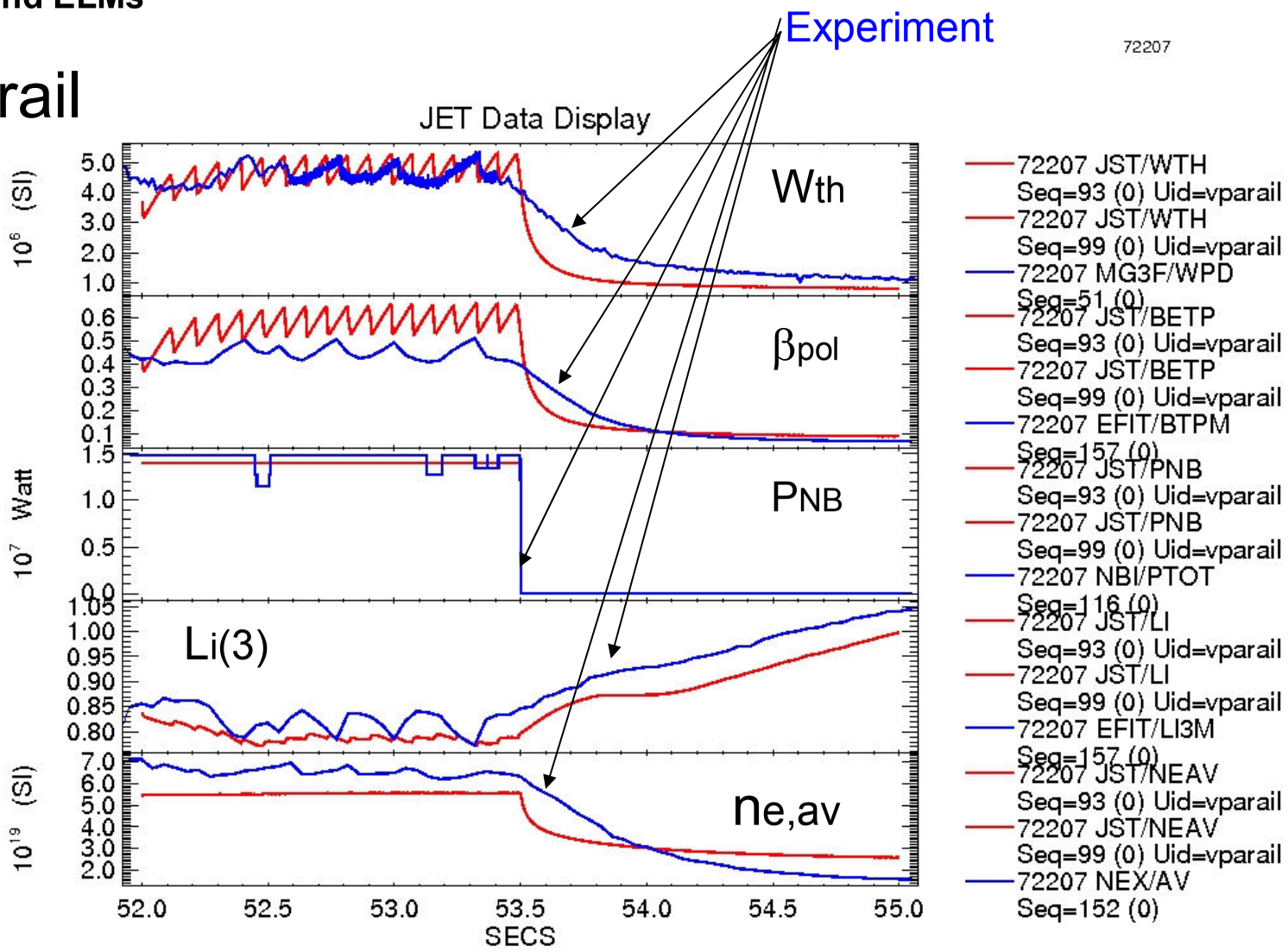
- Note: Elongation decreases and minor radius increases during ramp-down



# What if H-mode is lost during flat top? (2)

**Fully predictive modelling of shot #72207 has been done using JINTRAC with BgB model and model for ETB and ELMs**

V. Parail



# What if H-mode is lost during flat top? (2)

V. Parail

**Main profiles during H-mode (red) and L-mode (blue)**

**solid lines- modelling, dash - experiment**