Long pulse ion heating XP

D. Gates

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New Transport Rules

- Usual paradigm (for ions):

$$P_{cond} = P_{in} - \frac{dW_i}{dt} - Q_{ie}$$

- Use this equation to determine conduction power and thereby determine the thermal conductivity
- But if P_{in} is also unknown then

$$P_{in} - P_{cond} = \frac{dW_i}{dt} + Q_{ie}$$

- 1 equation and 2 unknowns

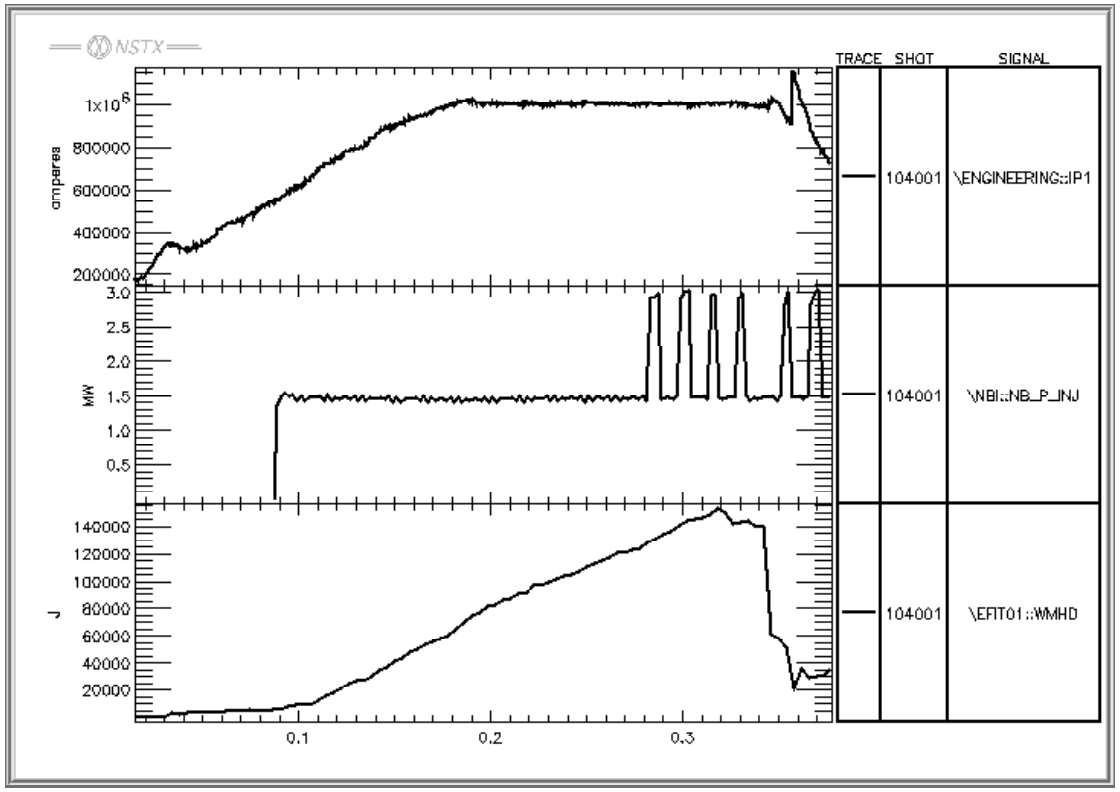
Approaches to determining P_{in}

- Approach 1
- Assume you know χ_i and determine what P_{in} would be
  - What if your wrong about χ_i?

- Approach 2
- Minimize conduction losses and ignore them
  - What if conduction losses are not small?

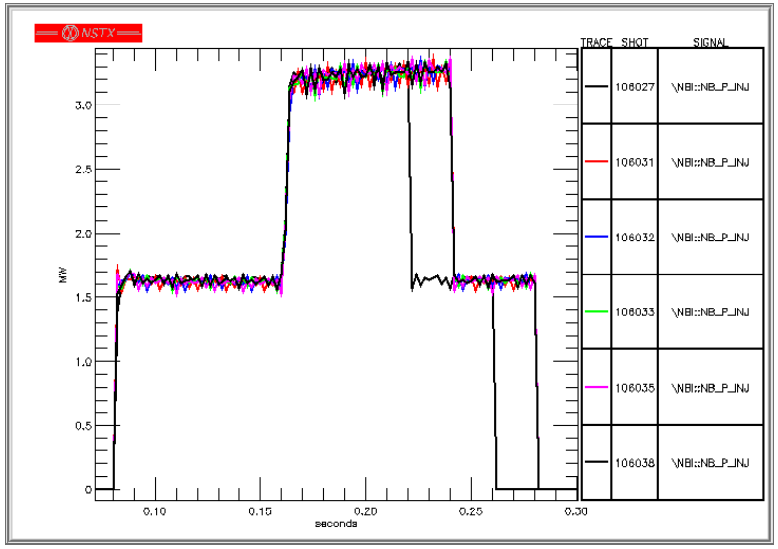
Confinement is best in long pulse discharges

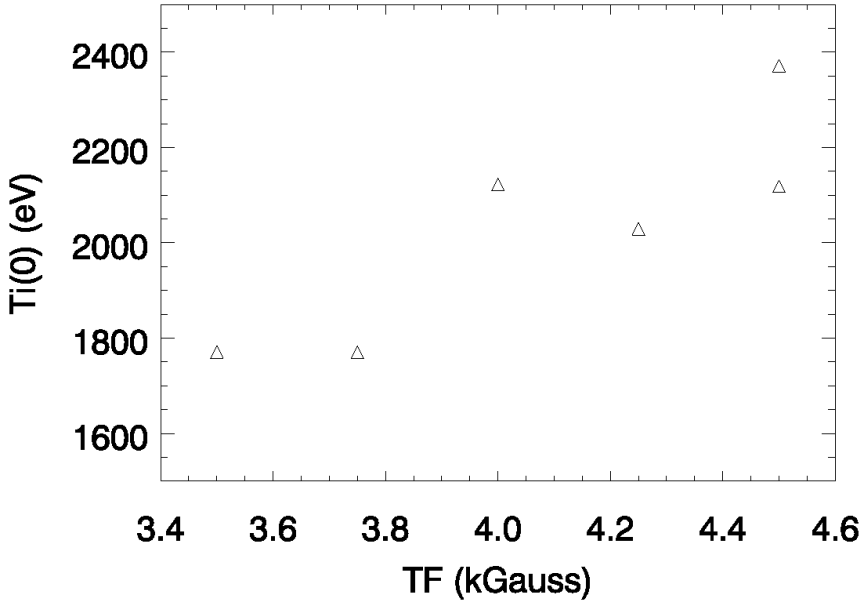
- Stored energy increases linearly until MHD event
- Implies steadily improving global confinement
- Ion power balance discrepancy will therefore be greatest at the end of the shot!
- The longer you wait the smaller the conduction losses



Higher TF improves confinement

- TF Scan shows highest T_i for highest TF
- Beam powers similar and I_p constant





Summary

- Long pulse discharges will be best for identification of Ti anomaly due to maximal confinement
- Beam voltage scan will be more determinate in showing the effects of CAE modes due to greater certainty in discrepancy