# Integrated Scenario Development

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# ISD Milestones

- 03-2) Explore and characterize spherical torus plasmas having simultaneously good plasma containment and high plasma-to-magnetic pressure ratio for durations much larger than the energy containment times. (9/03)

- 03-3) Measure and analyze the effectiveness of using a combination of noninductive techniques to assist in startup and sustainment of plasma pulse lengths up to 1 s. (9/03)

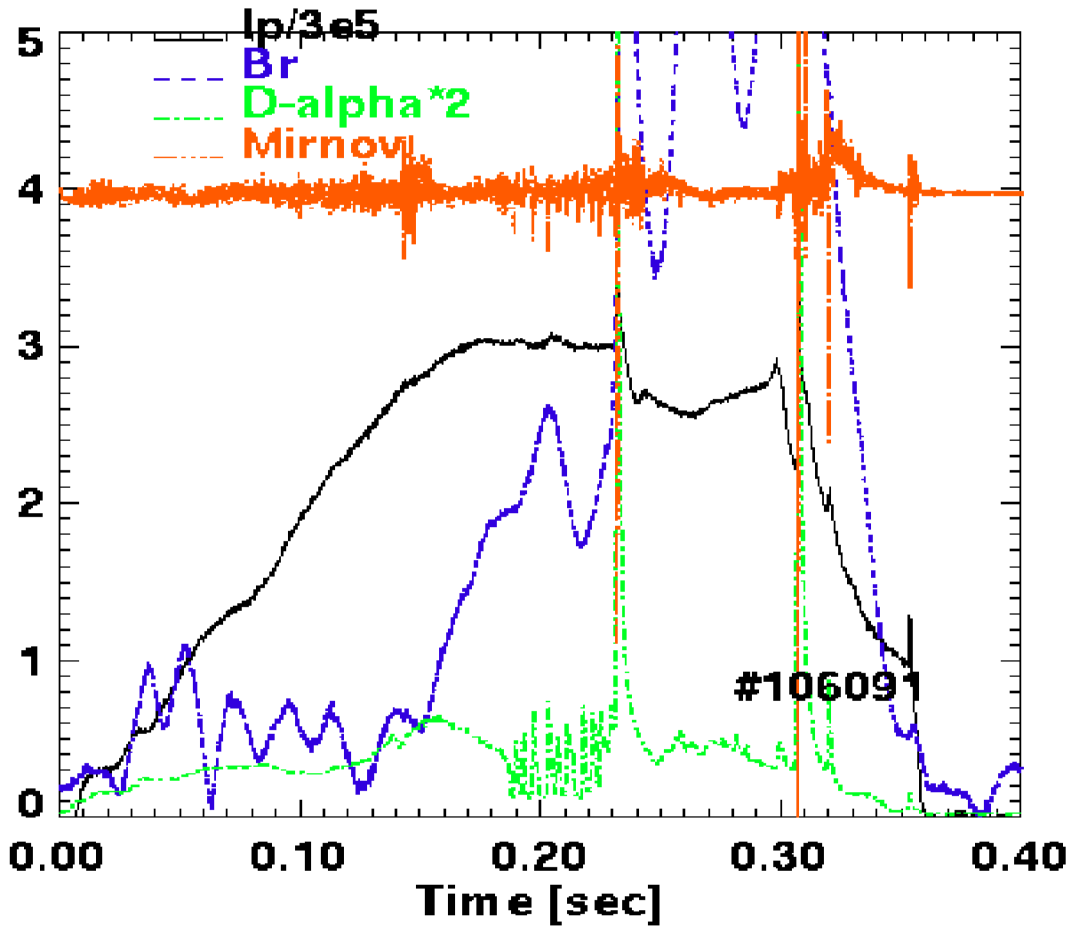
- 03-4) Demonstrate on NSTX innovative techniques for starting up plasma currents in toroidal fusion devices that will allow these devices to be made simpler, run longer, and cost less to construct. (9/03)

# Machine improvements key to integration success

- Error field reduction
  - Improved H-mode access
  - Higher beta limit
- High temperature bakeout
  - Better access to improved confinement
  - More flexible machine (easier to recover from events)
  - Better density control
- High field side gas puff
  - Better RF coupling in limited discharges?
  - Better H-mode access
- Improved control
  - Reduced plasma-wall interaction
  - Likely the key to success in CHI startup

# Error field reduction may prevent locked modes

- Locked modes limit single-null discharges
- Likely cause of plasma current limit for H-modes
- May explain beneficial effect of early NBI



# Good RF heating key to long pulse

- Early NBI does not appear to heat electrons much - ?
- RF H-mode discharges most encouraging long pulse candidates - low loop voltage with high $\beta_p$
  - But need to have higher current
- Current Drive can be a big component as well
- Can RF be compatible with NBI?

# Summary

- Integrated scenario development new task - likely to be a challenging one
- Any ideas on how to achieve this goal are welcome
- Non-inductive startup and sustainment are essential for the success of the ST concept
- Machine improvements will change the operating regimes of the experiment - need to remain flexible