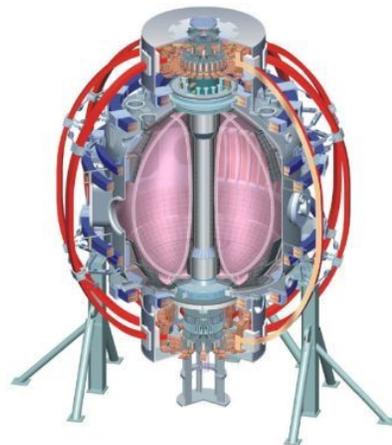


Dependence of density profile modification, and pedestal/core performance on amount of lithium evaporated between discharges

College W&M
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 Columbia U
 Comp-X
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Rajesh Maingi, 

NSTX Research Forum: Boundary Physics
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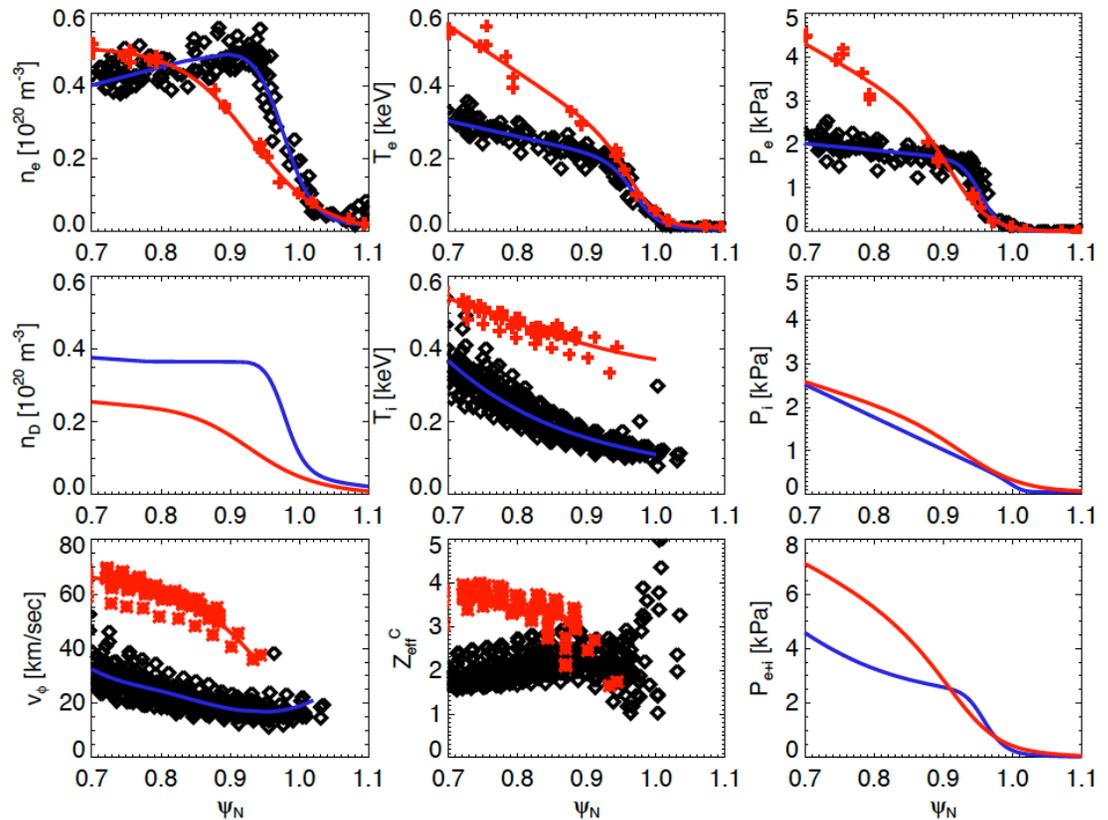
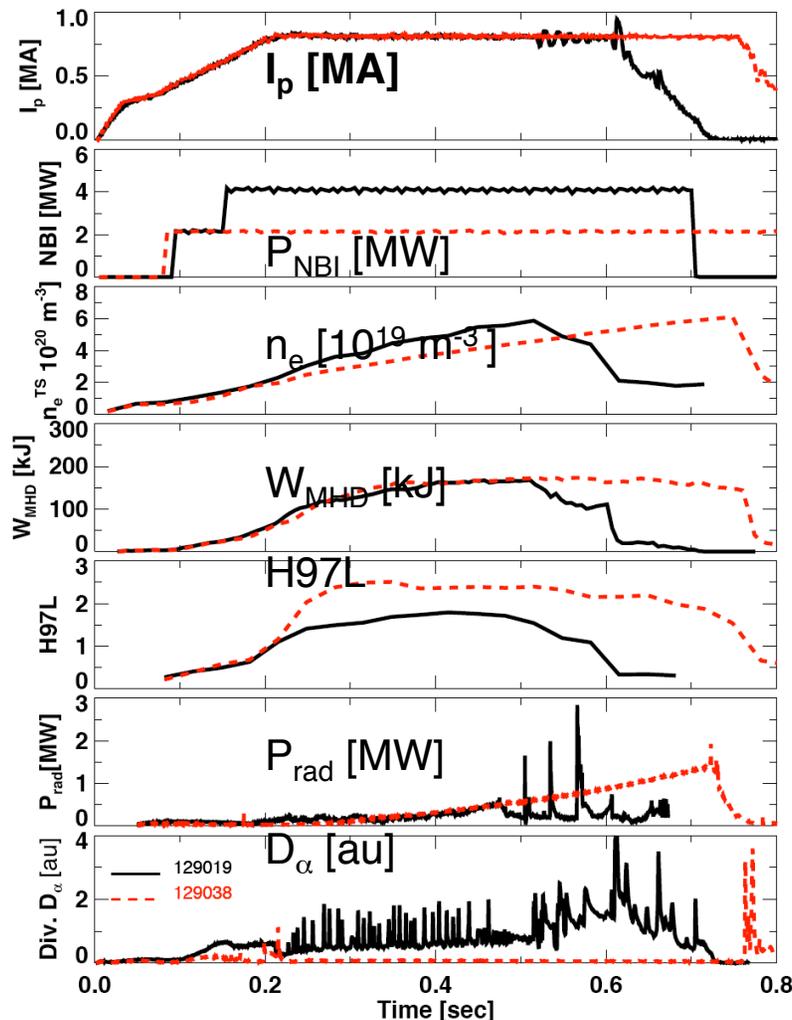
Goals and Background

- Goal: measure the edge n_e , T_e , T_i , and rotation profiles vs. the amount of lithium evaporated between discharges in the ELM-free regime
 - The pedestal structure and stored energy, and global τ_E will be documented
- When the lithium evaporation rate is “marginal”, ELMs are suppressed gradually, with growing periods of quiescence
 - The edge n_e profile gradient is reduced, the edge T_e profile gradient is unchanged, so that the edge pressure profile change follows mainly the change in the n_e profile
 - Thus, j_{bs} and $j_{||}$ move farther from the separatrix, which is stabilizing to the kink/peeling mode art of the instability drive
- Here we propose to document profiles in the ELM-free regime from ~300 mg-1000 mg lithium between discharges: **does the n_e profile change continuously with increasing lithium?**
 - * Lithium effects on pedestal is NSTX unique contribution to FY11 JRT
 - We don't have systematic data on intermediate lithium deposition rates from previous scan: only 100-250 mg (ELMy) and then 700 mg (ELM-free)

Edge n_e profile change with heavy lithium deposition and invariant T_e profile dominate pressure profile change

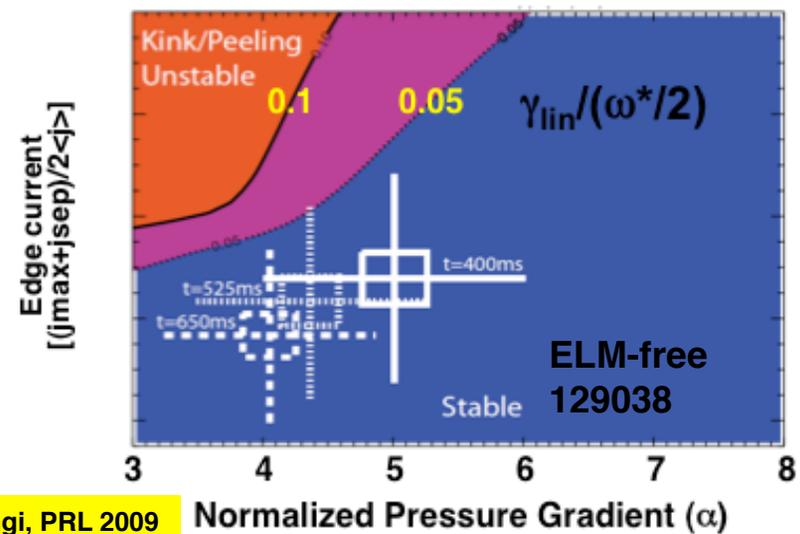
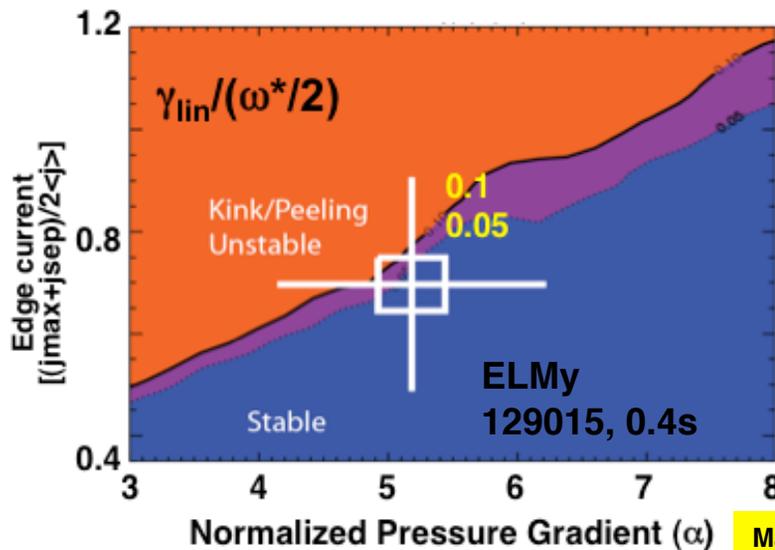
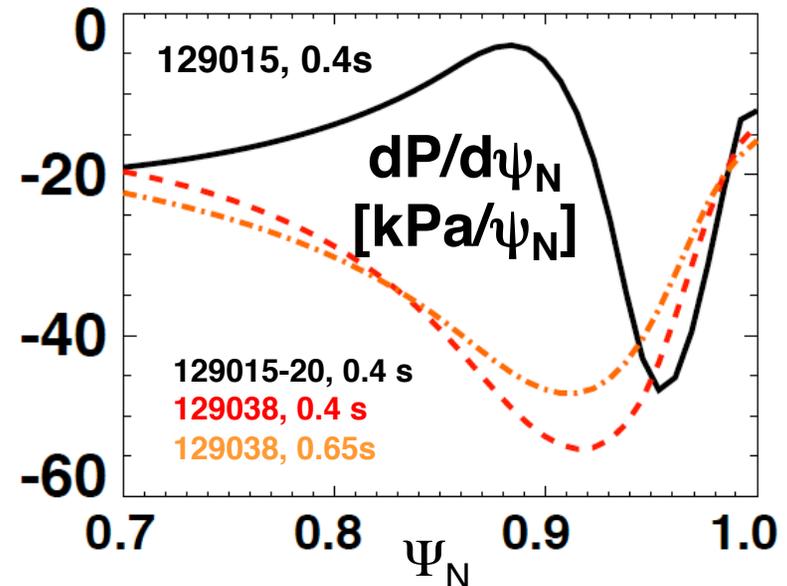
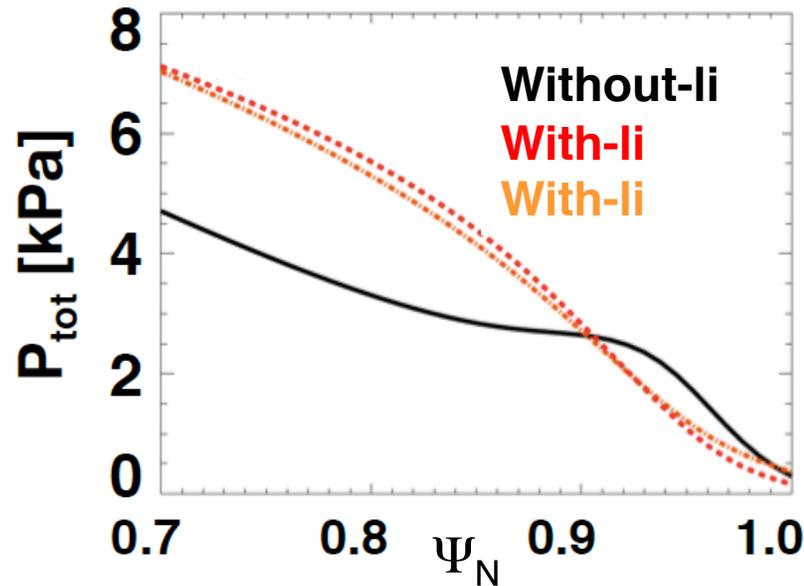
~ 700mg Li
between 129037
and 129038

- Edge n_e profile change leads to less j_{bs} and less $j_{||}$ near separatrix, which is stabilizing to kink/peeling drive



Mansfield, JNM 2009; Maingi, IAEA 2010

Peak edge pressure gradient (and bootstrap current) farther from separatrix with lithium coatings



Maingi, PRL 2009

Experimental Plan (1/2 - 1 day)

- Reproduce ELMy discharge, e.g. 129019, with minimal amounts of lithium, i.e. only as much as needed for reproducibility
 - 5 MW, 3 MW and 2 MW P_{NBI} values, the latter as anticipated for high lithium rates below; *may skip this step if time doesn't allow for it*
- Increase lithium to $\sim 250\text{mg}$ to suppress ELMs, and document the profiles
- Increase lithium in 50, 100, or 200 mg increments, depending on available time, and document the profiles
 - May need small fueling scan at each deposition rate to insure long pulse, well-behaved discharges
- Determine if the n_e profile gradient reduction and divertor recycling coefficient scales with the amount of lithium deposited