

Dependence of edge profile modification on proximity of strike point to LLD

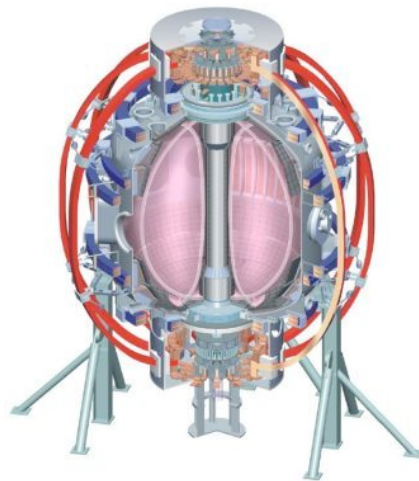
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R. Maingi,



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Effect of OSP location on pedestal density profile with LLD

- ELMs disappeared gradually in low δ discharges with increasing Li
- Main change in n_e and v_ϕ profiles
- Semi-analytic model predicts that n_e pedestal width should increase dramatically with decreasing edge density (at constant transport)
 - This could represent biggest knob on edge n_e , pressure profiles, and thus ELM control
- **Proposal: vary LLD pumping by changing OSP location and assess effect on edge profiles**

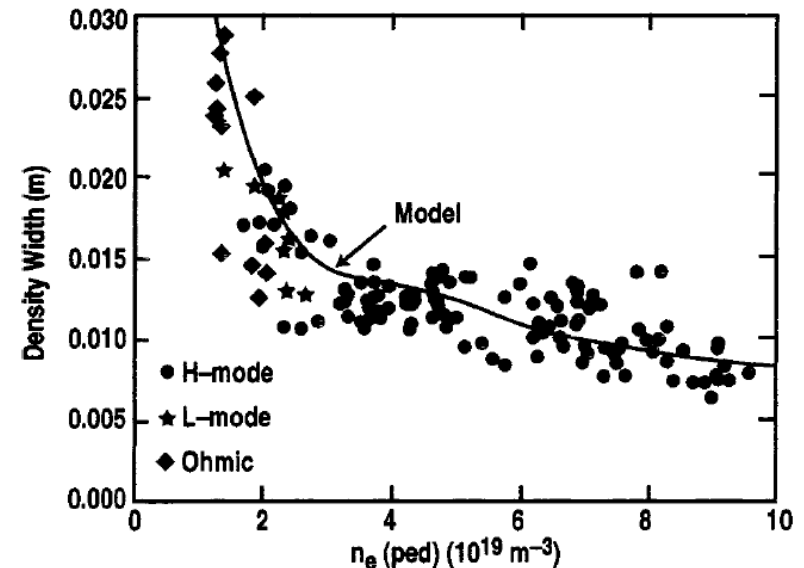


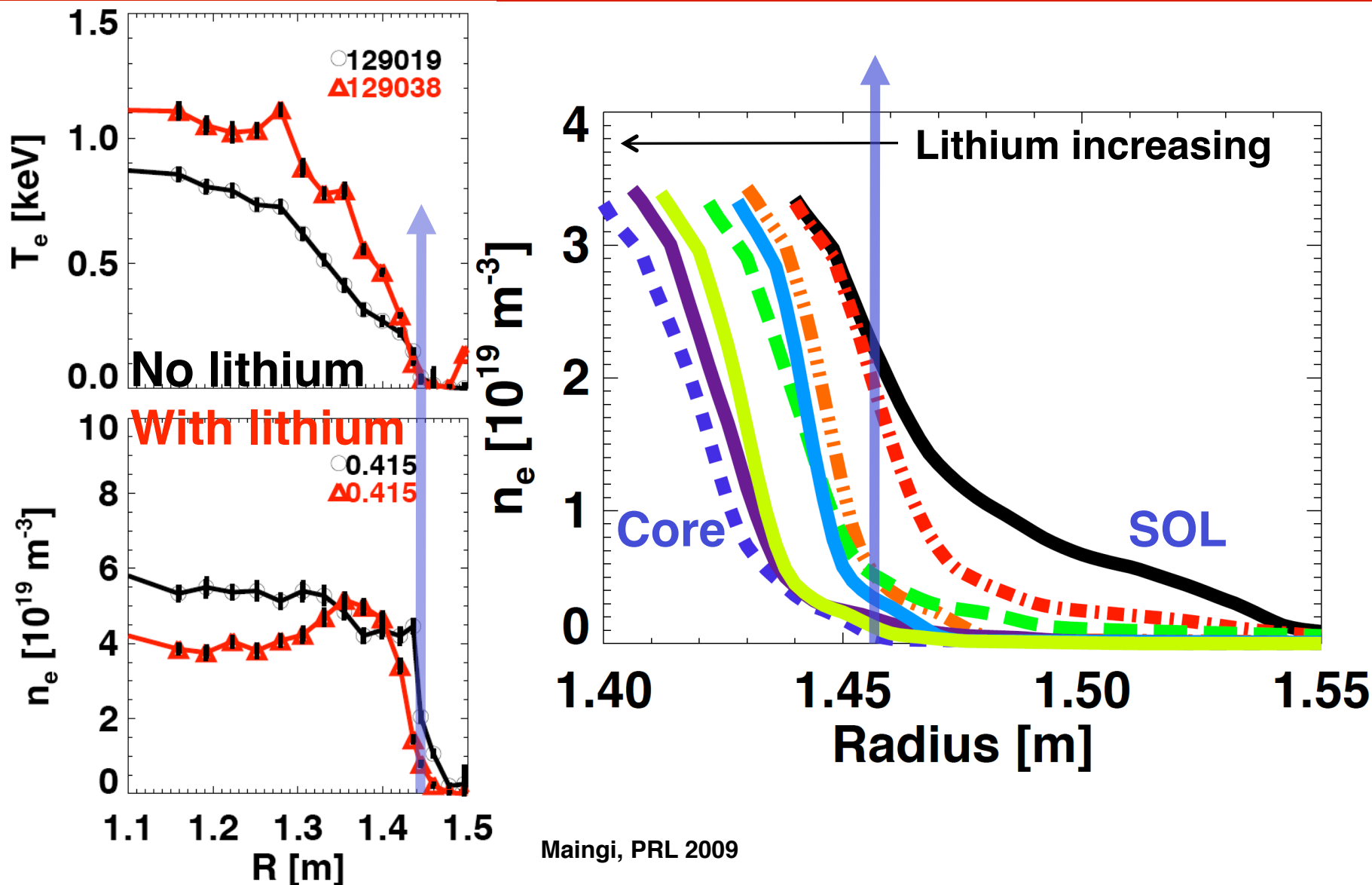
FIG. 4. A fit of the experimental data to the predictions of the analytic model density width projected to the outboard midplane.

M.A.Mahdavi, PoP 2003

FY2010 Research Milestone R(10-3): Assess H-mode pedestal characteristics and ELM stability as a function of collisionality and lithium conditioning

The high performance scenarios of next-step STs such as NHTX and ST-CTF are based on lower Greenwald density fraction and significantly lower pedestal collisionality than NSTX, which could significantly alter their H-mode pedestal characteristics. Possible differences include deviations from the L-to-H transition threshold power scaling inferred from present ST experiments, different projections for the pedestal height and barrier width, pedestal stability (affecting ELM type and size), and the down-stream divertor plasma and surface conditions, which can also influence the pedestal. Many different ELM regimes have been identified on NSTX, and the dependence of these regimes on collisionality and lithium will be investigated utilizing high-resolution kinetic equilibrium reconstructions coupled to leading linear and non-linear ELM-stability codes to compare to experiments. Pedestal profiles will be compared to kinetic neoclassical predictions to determine if the observed transport is consistent with theory. Particle pumping and density control in these experiments will utilize the liquid lithium divertor (LLD), and a major research focus in this research will be to determine the relative roles of reduced pedestal density and collisionality versus the possible direct effects of lithium. This research will aid development of a predictive capability for pedestal transport and stability limits for the ST, and through comparisons to results from higher aspect ratio tokamaks, will help aid understanding of the role of toroidicity in H-mode confinement.

Edge/SOL n_e decrease with lithium coatings thought to be responsible for ELM stabilization



Maingi, PRL 2009

Proposed run plan

- Variation of LLD pumping will be accomplished by varying OSP location relative to LLD
 - Overlaps nearly 1:1 with Kugel's LLD commissioning XP that will develop OSP locations of 0.35m, 0.5, 0.75m, 0.63m, with conventional and SGU fueling, and with LLD cold and at ~ 215 °C
 - P_{NBI} reduced with OSP on LLD
 - Need to keep outer gap ~ 10 cm for optimal Thomson resolution
 - Need UCLA and ORNL reflectometry
- Edge profiles will be analyzed with standard profile analysis tools (developed by Osborne)
 - Edge stability analyzed with ELITE and PEST
- Requested run time: 1 day dedicated for systematic scan after substantial piggybacking on Kugel's XP