

## Eight impurity control XPs proposed for 2010

<b>XPs:</b>	<b>Author:</b>	<b>Title:</b>	<b>Status:</b>
XP1002 (LR)	Soukhanov -skii	Core impurity density and radiated power reduction using variations in LLD divertor conditions (0.5 day so far).	Ran 0.5d on 6/21 0.5d sched. 8/9
XP1005 (ASC)	Menard	Modifications to the early discharge evolution to reduce late impurity content evolution	Ran 0.5d on 6/16
XP-1006 (ASC)	Gerhart	Development of High-Elongation Beam Heated Scenarios with Reduced Impurity Content and Increased Non-Inductive Fraction	Sched. 9/1
XP-1007 (ASC)	Bell	Use of HHFW heating to increase the non-inductive current fraction in NBI-produced H-mode plasmas with triggered ELMs to control impurity buildup	Not on sched.
XP-1024 (LR)	Skinner	Controlling Impurity Sources by Diffusive Lithium Injection	Not on sched.
XP-1027 (ASC)	Canik	RMPs below the ELM triggering threshold for impurity screening.	Ran 0.5d on 6/3
XP-1056 (LR)	Mansfield	Can Li Aerosol Injection Mitigate High-Z Impurity Accumulation During ELM-Free H-modes?	Sched. 0.5d 7/20
XP-1065 (LR)	Skinner	Methane injection to assess carbon impurity screening	Not on sched.

# XP1065 Methane injection to assess carbon impurity screening

(Skinner: LRTSG review 9 June 2010)

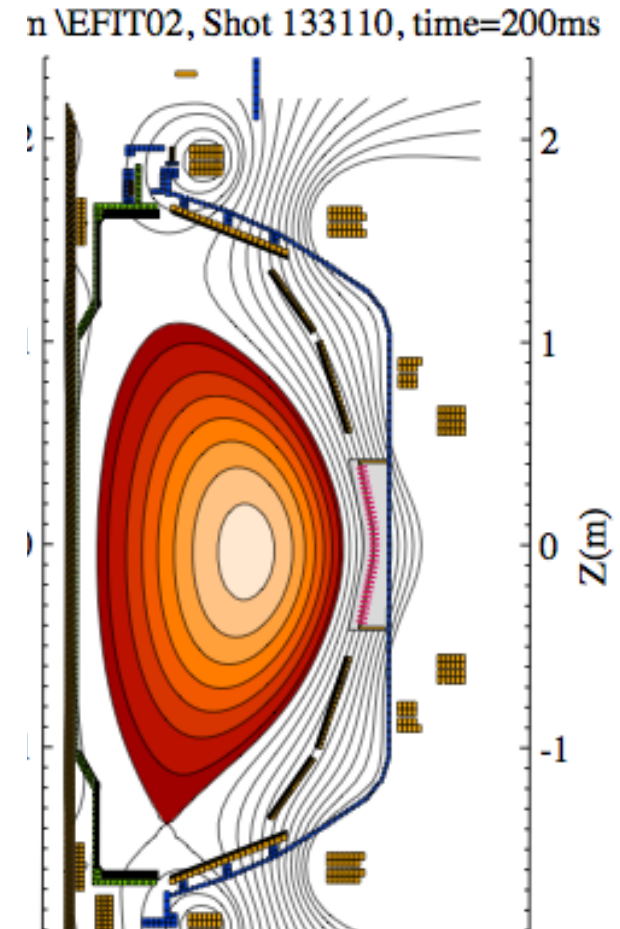
## Experimental run plan:

1. Reproduce high performance, low triangularity fiducial with normal Li evaporation rate (20 mg/m for 10 mins)  
e.g. 133110 shape but longer pulse length
2. Inject X torr-I of  $CD_4$  from lower dome branch 5 gas injector. Assess increase of core carbon density from CHERS diagnostic.
3. Increase methane injected until increase of core carbon density is measurable. Repeat final setting (5-7 shots total)
4. Controlled access to switch  $CD_4$  bottle to midplane gas injector (2nd  $CD_4$  bottle would allow 4-5 more shots)
5. Inject X torr-I of deuterated methane from midplane gas injector. Assess increase of core carbon density from CHERS diagnostic. Repeat final setting (5-7 shots total)
6. Increase methane injected until increase of core carbon density is measurable.

Total shots 14 + controlled access anticipate ~ 1/2 day.

## Options with more time:

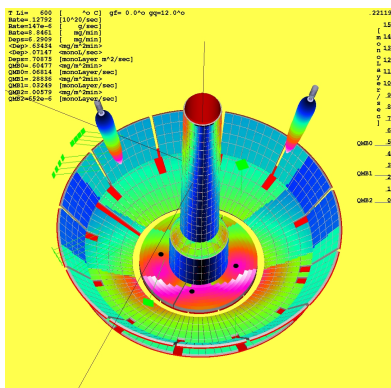
- Compare with / without lithium (R.R. concern on reproducibility without Li)
- Inject  $CD_4$  from CS shoulder injector (R.R. concern on time constants)
- RR suggests repeating midplane, then lower dome inj. 1,2,3 into private flux.



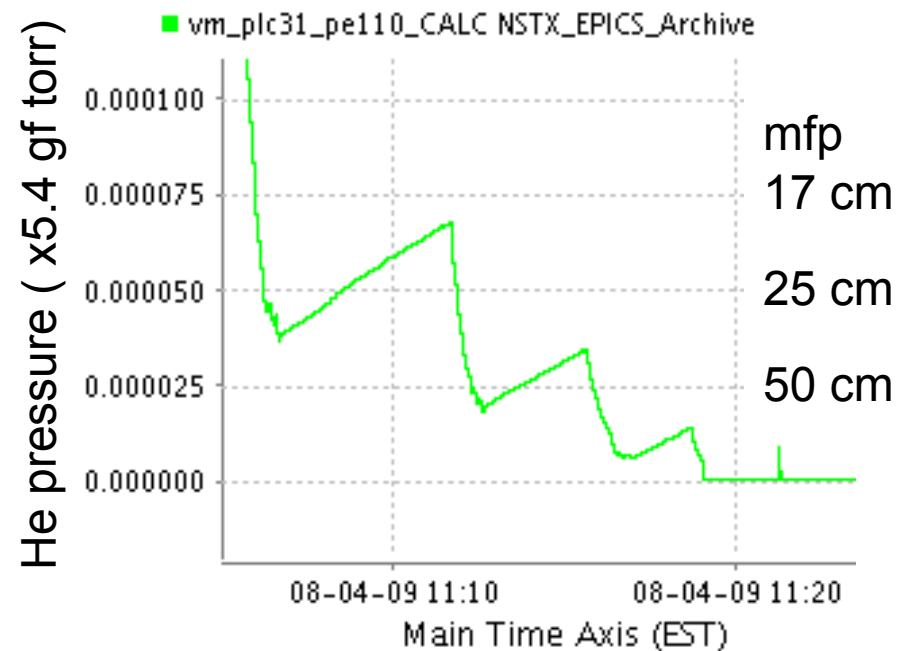
# XP1024 Li diffusion in He (Skinner LRTSG review 11 March 2010)

## Concept:

- Increase Li coverage of NSTX upper vessel wall by evaporating Li into low pressure helium.
- Adjust mean free path of Li in He by varying the helium pressure to produce a diffusive coating of the upper vessel, midplane and regions not in line-of-sight to LiTER.

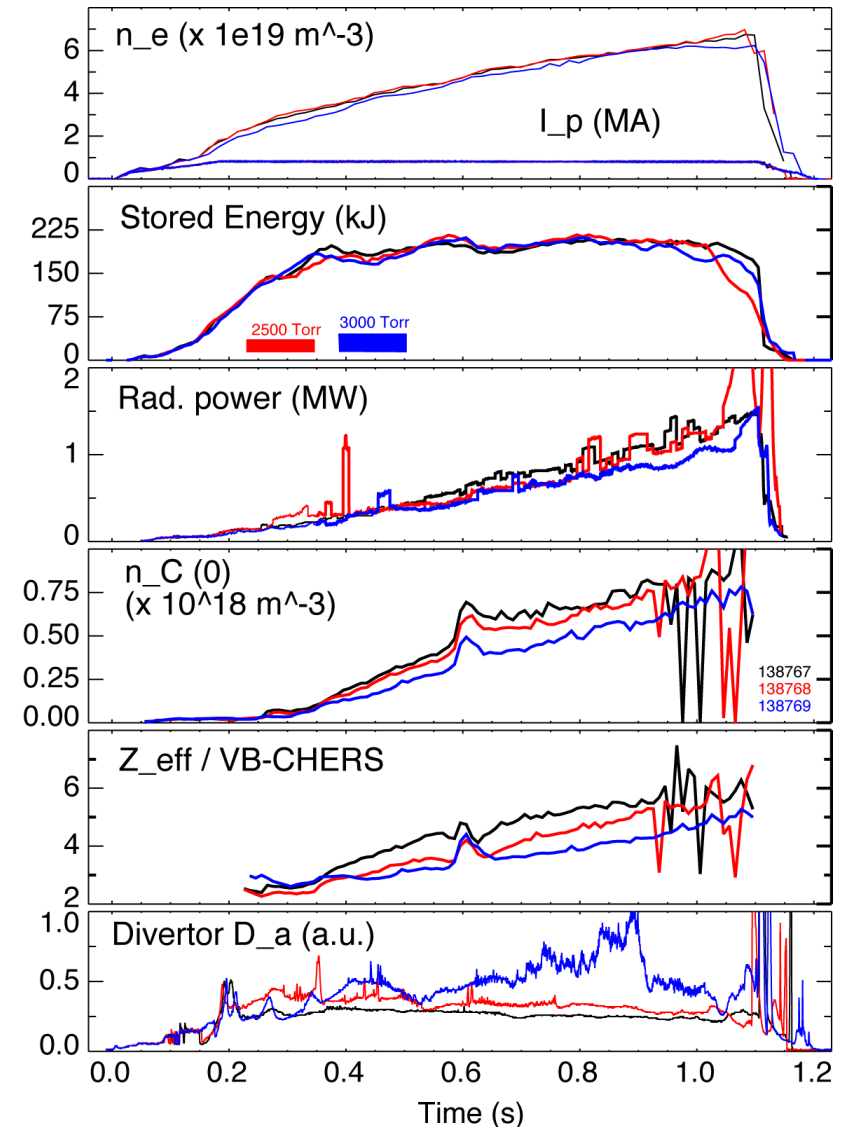


## Li diffusion in He (Aug 4, 2009)



# In XP 1002 small divertor $D_2$ injections were used to reduce core impurity density (Vlad)

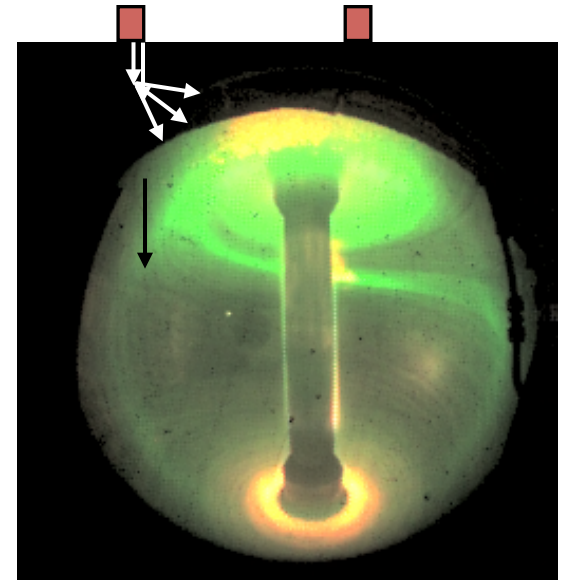
- High- $\delta$ , 0.8 MA , 4 and 5 MW NBI long H-mode discharges
- Shown: reference 4 MW shot in black, two shots w/ divertor gas in red and blue
- LITER 175-200 mg per shot, ELM-free and marginally ELMy
- $P_{rad}$  not spectacular (apparently not much metal influx on the day of XP)
- Obtained up to 30 % reduction in core carbon density (inventory) and  $Z_{eff}$
- Will use remaining 0.5 day to attempt to clarify the physics of impurity source and transport



# XP-1056: Can Li Aerosol Injection Mitigate High Z Impurity Accumulation during ELM-Free H-Modes?

(Mansfield)

- **Objective:** Determine whether or not Li aerosol injection can mitigate high-Z impurity accumulation in ELM-Free H-Mode discharges.
  - Is there a Li aerosol “Big Knob” (B.K.)?
  - What is the B.K.?
    - Bay I ?
    - Bay C ?
    - Prepositioned (P) ?
    - (I+C) ?
    - (I + C + P) ?
  - Illuminate the mechanism if mitigation is observed
    - Impurity screening ?
    - Mitigating NBI bad orbit losses ?
    - Covering all metallic surfaces with Li ?
    - Impurity purging ?



ASC XPs.....