Review of XP-719:
Investigate Effect of Lithium-Coated Divertor on Plasma Performance with LITER-1d

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Review of LITER-1d XP-719
at Boundary Physics Meeting of 1/31/07

- **The original proposed XP addressed the following questions:**

1. Does persistence of lithium effect on plasma depend on deposition thickness?
2. Does passivation and intercalation after deposition affect effectiveness of lithium?
3. What is effect of lithium coatings on density profiles with increasing density?
4. Can decreasing the recycling per unit area by increasing the plasma wetted area through flux expansion (x2-20) by lowering the X-pt increase the effectiveness and duration of density control?

- **Comments from Review of XP-719 on 1/31/07**

1) Idea is to test FASTER, rather than more lithium deposition - want to make sure that deposition rate exceeds "passivation" rate as evaporative coating is put down.

2) Determining how to get active lithium coatings routinely is higher priority than finding out how many shots such coatings stay active without replenishment.

3) Recommendation is to "ratchet" up temperature on successive shots - procedure would be to automatically shut off power to LITER-1d heaters at same time (e. g., two minutes) before shot- Do not wait for temperature to drop to predetermined level: Shutters will be open for only -10 to +5 sec and "visors" now present for various windows that could be coated.

LITER-1d Update

- **Status**
  - Completed: FDR, PTP, ISTP, XMP-50
  - LITER-id in vessel in operating position, ready to start
  - Not completed: exploration of rise time scenarios & off-line testing
  - Not completed: completion of the outgassing observed during XMP-50
- **Operating characteristics During XP's**
  - ~15-20 min rise-time to operating temperature
  - cool-down time to lower evaporation >30 min
  - will evaporate during Discharges at the Between-Discharge rate
  - window shutters open from -10 to + 5 sec
  - capability to evaporate into HeGDC (similar to Lithiumization applied on HL-1M)

XP-719 Experimental Sequence

- **Procedure**

1. Without using HeGDC, start evaporating 30 mg of lithium at the same deposition rate between and during discharges for 3 discharges.

2. Then with each subsequent group of 3 discharges double the evaporated amount until a lithium pumping effect is observed. Proceed without inter-shot HeGDC to maximum evaporation rate in Table 1, or until H-mode is lost due to accumulation of injected gas on previous shots, or as determined by experimenters from review of diagnostic data.

3. If no Li effect or wall loading occurs, apply HeGDC during first half of Li evaporation.

4. If no Li effect or wall loading, apply HeGDC during 2nd half of Li evaporation.

5. If no Li effect or wall loading, apply HeGDC during entire Li evaporation.

6. Choose best experimental conditions from the above steps, and then optimize.

7. Choose best condition from step 6, and repeat at increasingly higher densities.

8. Choose best condition, and repeat using increasingly lower X-pt to increase the flux expansion & reduce the recycling per unit area.

Shot No.	Between-Shot mg*	Σ Btween Shot mg	During-Shot mg	Σ During-Shot mg	Nom. Oven °C
1	30	30	0.05	0.05	540
2	30	60	0.05	0.10	540
3	30	90	0.05	0.15	540
4	60	150	0.10	0.25	570
5	60	210	0.10	0.35	570
6	60	270	0.10	0.45	570
7	120	390	0.20	0.65	600
8	120	510	0.20	0.85	600
9	120	630	0.20	1.05	600
10	240	870	0.40	1.45	630
11	240	1110	0.40	1.85	630
12	240	1350	0.40	2.25	630
13	480	1830	0.80	3.05	660
14	480	2310	0.80	3.85	660
15	480	2790	0.80	4.65	660
16	960	3750	1.60	6.25	690
17	960	4710	1.60	7.85	690
18	960	5670	1.60	9.45	690

* Example for 10 min of evaporation between shots