DIII-D Li-DiMES Experiment Summary

(Sample Exposed May 1st 2000)

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Li-DiMES sample

- **~0.75 mm Lithium foil, 1 cm radius in SS "cup"**
- **Clean lithium surface maintained using argon purge transfer**

ALPS Project Meeting, ANL, May 8-9, 2000

Li-DiMES before exposure, April 25th 2000

Experimental plan

- **Expose lithium to typical DIII-D divertor strike point conditions with gradual increase of input power.**
- **Use lithium spectroscopy to measure outfluxes of lithium into divertor plasma.**
- **Combine with plasma diagnostics to determine lithium erosion yield.**

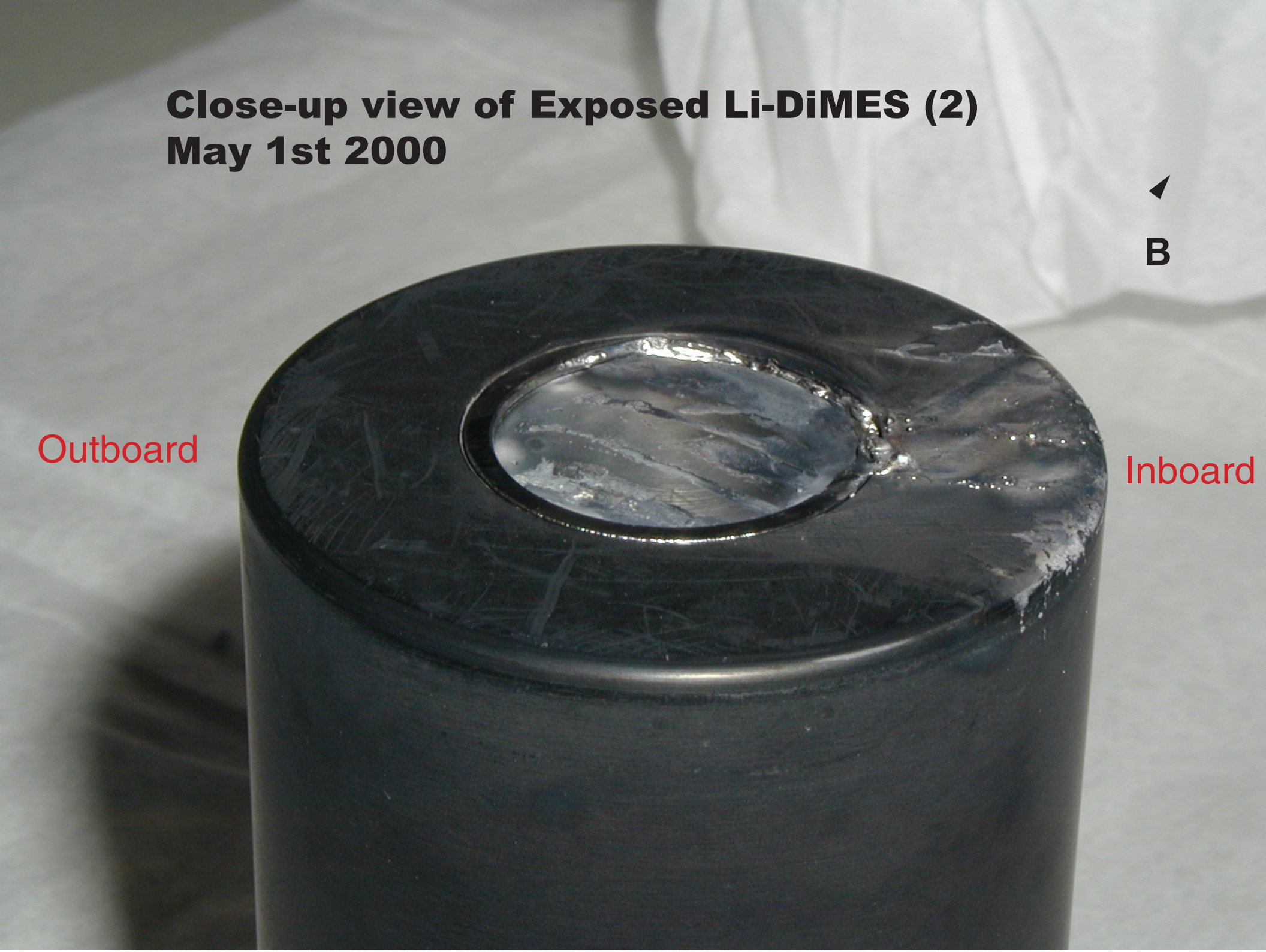
Experimental results

- Sample was initially exposed to moderate power ELMy H-mode plasma (6.5 MW injected power). Exposure was part of plan, but “premature” due to technical problem with hydraulics.
- Due to exposure miscue, limited divertor diagnostics available.
- This single exposure shot removed major fraction of lithium from surface with significant Lithium edge radiation in core plasma and increases in total core radiated power.
- Visual inspection of divertor floor revealed lithium “spray” to adjacent tile from DiMES, also seen by divertor spectroscopy.
- Visual inspection of DiMES in-situ and after removal show all the lithium was removed and SS lip was eroded significantly.

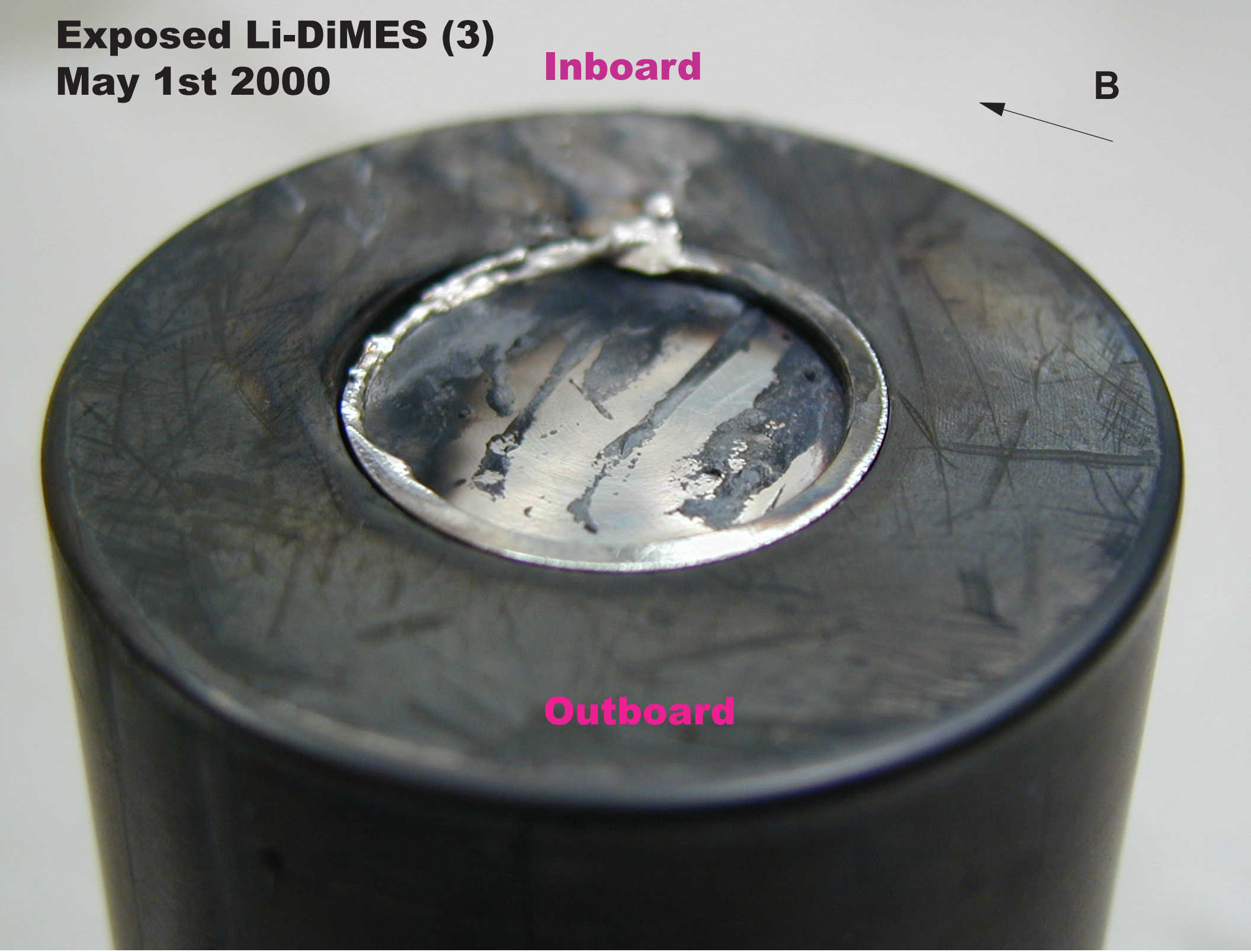
Li-DiMES After Exposure (1)

May 1st 2000

Close-up view of Exposed Li-DiMES (2)
May 1st 2000



Exposed Li-DiMES (3)
May 1st 2000



Preliminary analysis of DiMES lithium removal

- Maximum surface temperature of tiles: ~300-400° C (but probably less with sweeps) from q~1-2 MW/m^2 near outer strikepoint.
- Thermal analysis also indicated that short exposure time at < 1 second would likely result in entire sample liquefying. (Tiles and liquefied lithium will have similar temperature).
- Lithium radiation "bursts" from core SOL correlated to ELMs, even when DiMES is ~7 cm away from strikepoint.
- Plasma disrupted when strikepoint moved to DiMEs location with large amounts of metallic (Fe) and lithium radiation.

Preliminary Conclusions

- **Modest heating and/or ELMs liquefied Li sample.**
- **Known JxB forces resulting from thermo-electric currents during ELMs caused macroscopic displacement of lithium.**
- **Once lithium was removed, the SS lip became a leading edge and subsequently evaporated a few cubic mm of metal into plasma.**
- **Will have to review divertor and core diagnostic coverage to further understand lithium removal.**

Next Step

We will implement measures to assure sample location and to request DIII-D experimental time for the next Li-sample experiment.