Li-DiMES EXPERIMENT STATUS

and new observations for shot 105508

Presented by C. Wong

Great support provided by the DiMES team

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ALPS project meeting
Grand Canyon, April 9-10, 2003

INITIAL GOALS FOR THE Li-DiMES EXPERIMENT

a. **Demonstrate the control/mitigation of the MHD effect on liquid lithium in the lower divertor of DIII-D**

b. **Quantify the temporal and spatial distributions of the tile currents.**

c. **Vaporize significant amount of Li in the private region to benchmark the modeling code from the transport of Li.**

For the FY03 DIII-D submission:

"The heated and wetted Li-DiMES experiment"

SIMPLIFIED GOAL

We would like to understand the MHD interaction between the parallel current and the liquid Li at the lower divertor of DIII-D.

Experimental guide:

1. **Expose a melted Li surface to the plasma.**
   (This is to avoid the additional complexity of phase change.)
2. **Expose the Li but not the metallic edges or screen to the plasma.**
3. **Measure the induced current in the lithium.**
4. **Measure the tile/parallel current variation as a function of time and space during a low power L-mode discharge with different locations of the strike point.**
   (We will use additional tile current monitors.)
5. **Quantify the temperature change of the liquid lithium.**
6. **Record all plasma parameters at the divertor and the lithium signals in the SOL and in the core.**

We are limited by the number of appropriate instrumentation wires in the DiMES system.
(For heater, thermocouple, tile monitor, and induced current monitor)

Basic requirements:

- Melt Li by heater in-situ
- Temperature measured by thermocouple
- Li must be wetted
- Tile current monitors

Different design variations were considered:

- Li-surface geometry: circular, cross, slots
- Holding of Li: porous medium, free surface
- Electrical properties: grounded, floated
- Induced current: w or w/o electrodes

WE LEARNED A LOT FROM PISCES EXPERIMENTS

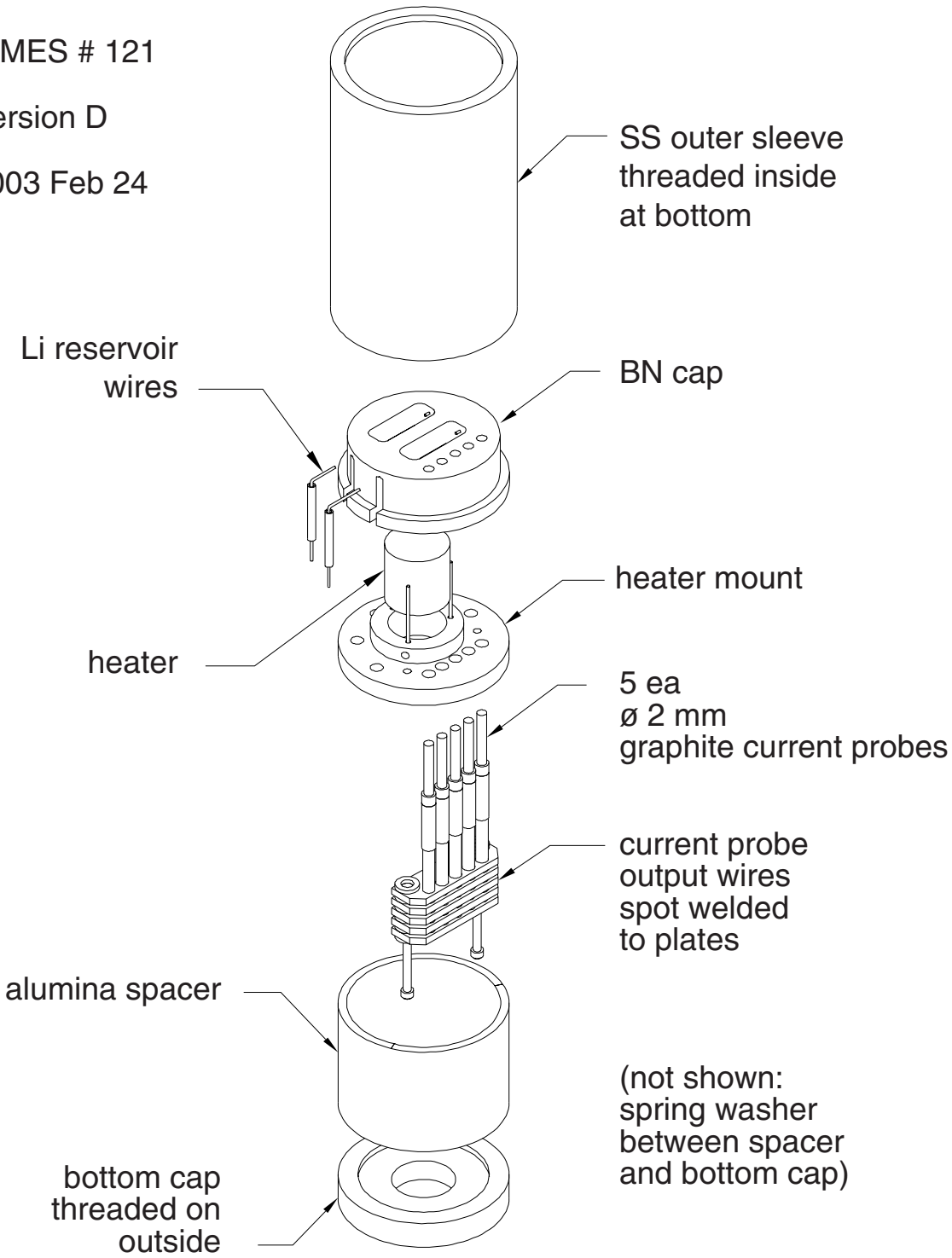
- Li won't wet on BN
- BN slightly interacts with Li
- Li can be wetted on SS and Mo surfaces
- Li will wet at ~ 400˚ C

Doerner, UCSD

DiMES # 121

version D

2003 Feb 24



Note:
In order to have 5 current probes, 2 wires in each Li reservoir, heater and thermocouple all on independent circuits, the shield wire must be used as a current carrying conductor.

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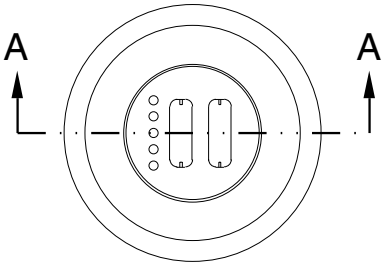
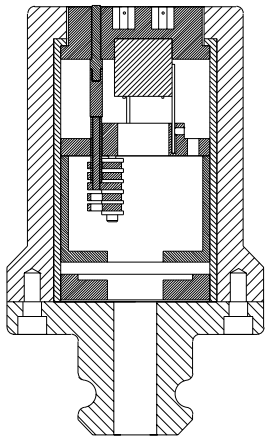
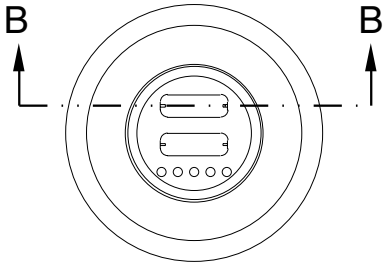
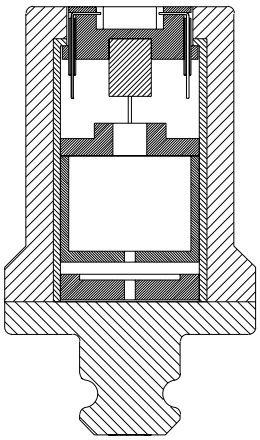




SECTION A A





SECTION B B

assembled

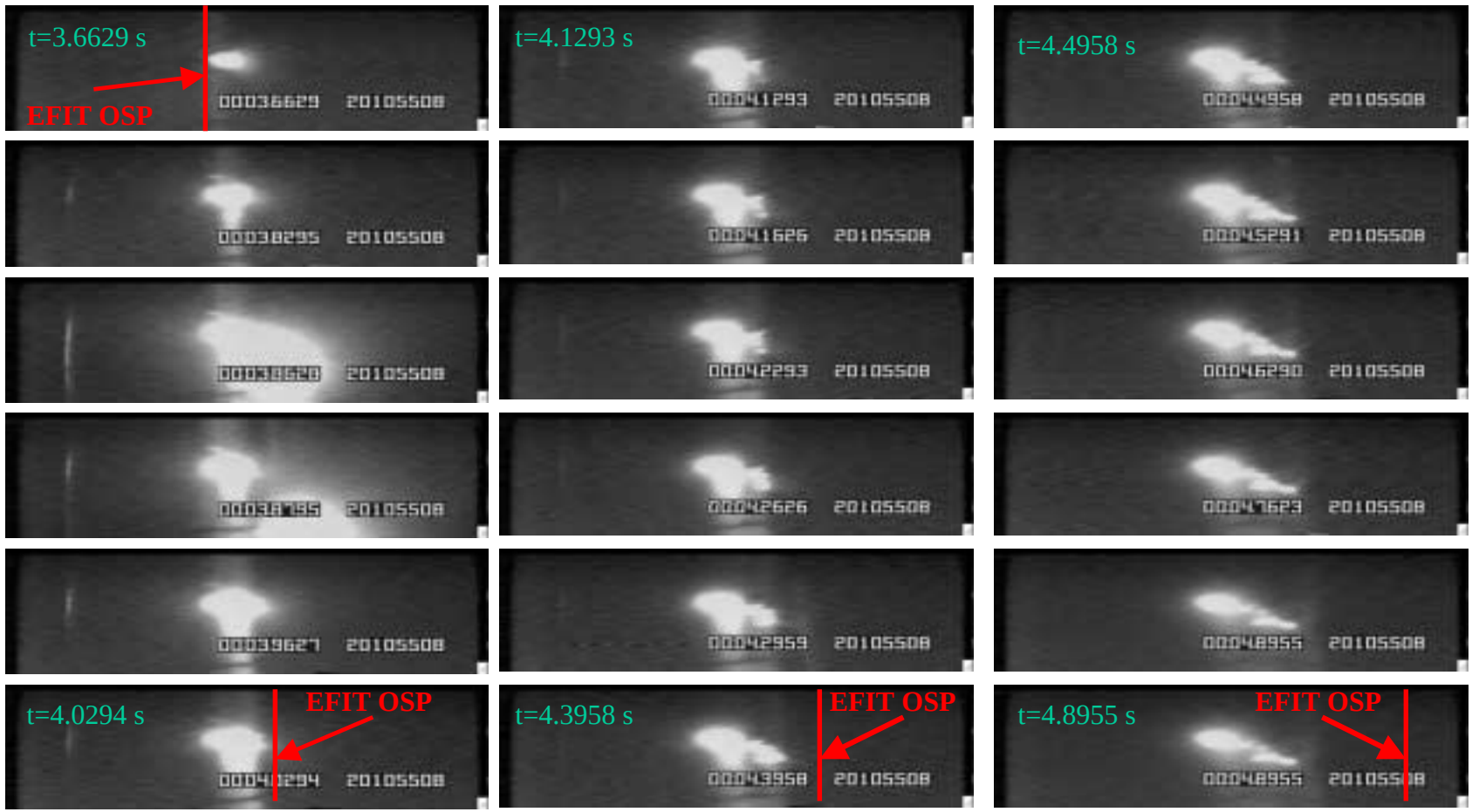
Li-DiMES PREPARATION STATUS

(DiMES system is fully functional)

- **DIII-D Li-DiMES review scheduled for April 28th**
- **Doerner will coat BN slots with Mo**
- **Bastasz and Whaley will prepare the Li-DiMES sample**
- **Rudakov is setting up external instrumentation**
- **Evans is reviewing diagnostics required and past data**
- **Morley is setting up the MHD modeling**
- **Watkins is providing consultation and support**
- **We will have to go after exposure opportunity in DIII-D**

Li SAMPLE EMISSION DURING STRIKE POINT SWEEP (DIII-D shot 105508 “before the disruption shot 105511”)

Li melts and flows across the DiMES sample holder



The Li sample (centered at R = 1.485 m) melts and flows across the DiMES probe and divertor floor as R_{ops} decreases from 1.494 m at t = 3.6629 s to 1.369 m at t = 4.8955 s.