

Multi-species materials sputtering studies in IGNIS-2

M. Nieto-Perez and the EMPIRES team



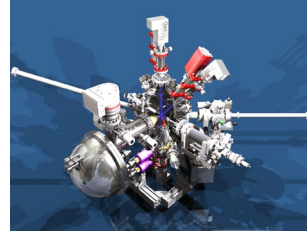
EXPLORATION OF MATERIAL-PLASMA INTERACTION AND RADIATION EFFECTS ON SURFACES



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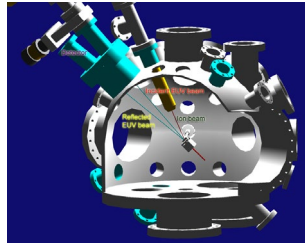
20 years of PMI lab experiments



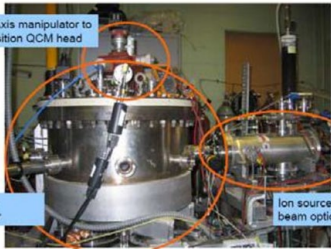
IGNIS @ Illinois 2014



IMPACT @ Purdue 2008

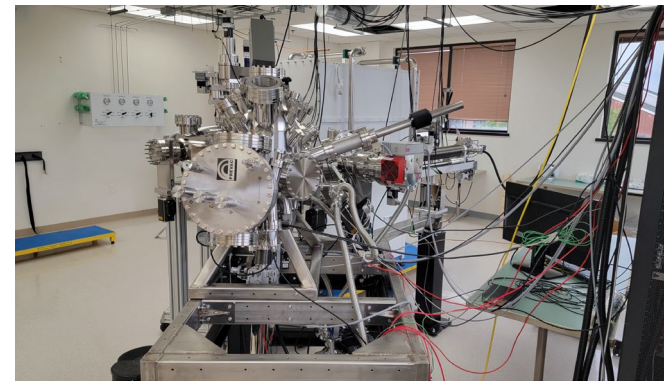


IMPACT @ ANL 2005

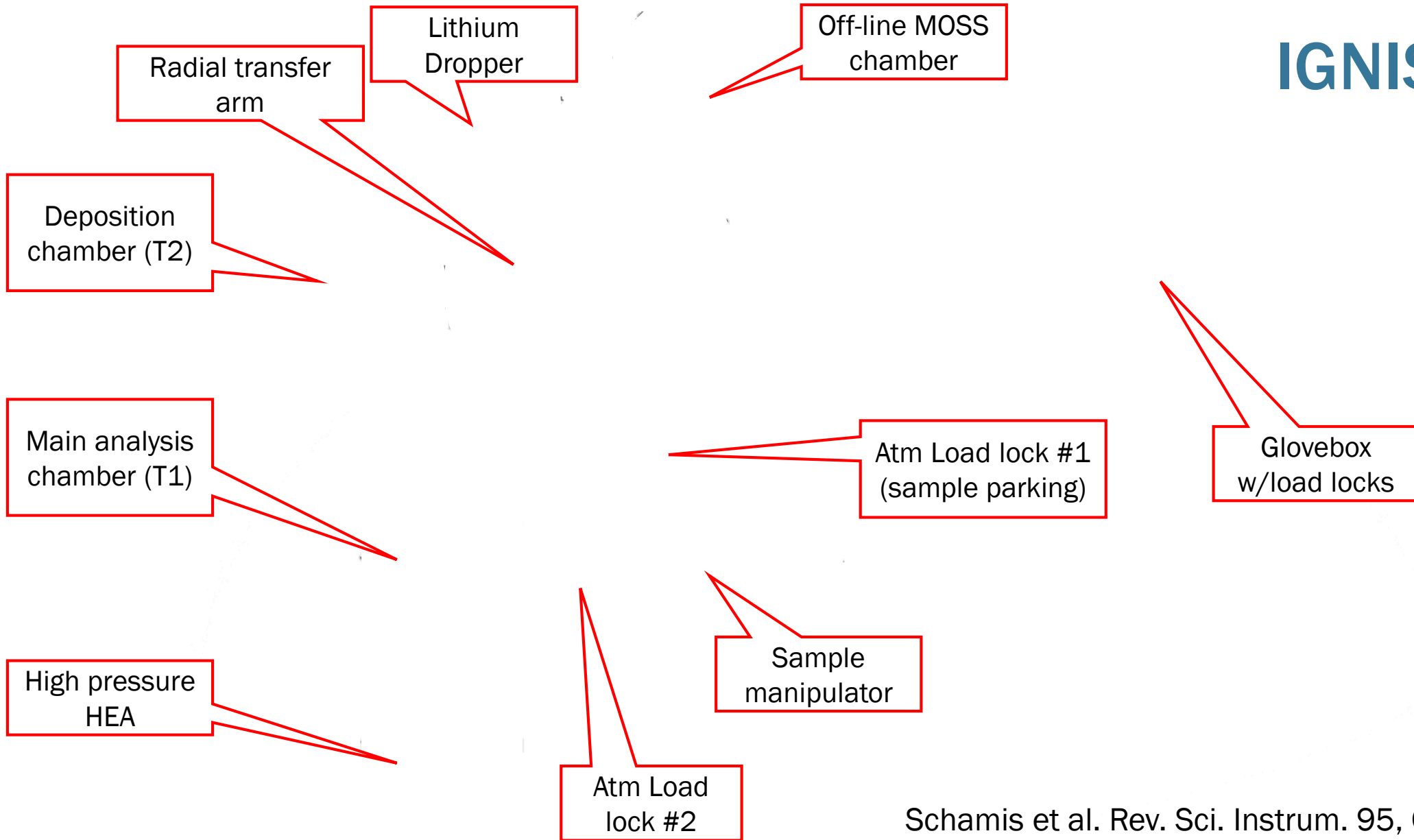


IIAX @ UIUC 2000

IGNIS-2 @ Penn State 2023



IGNIS-2



Schamis et al. Rev. Sci. Instrum. 95, 043508 (2024)

How can IGNIS-2 contribute to D-IIID wall change program?

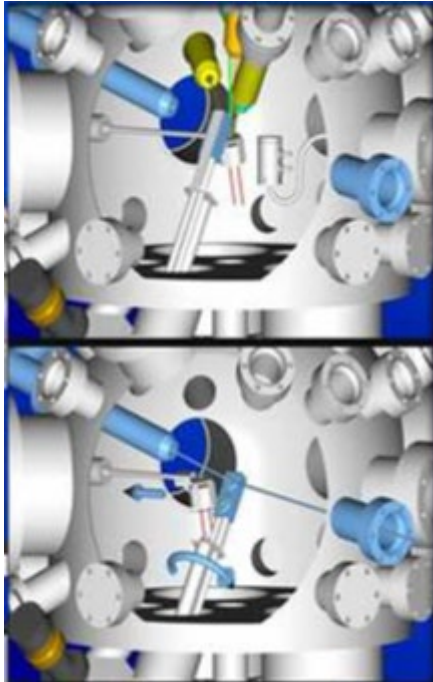
- Advanced surface characterization station with exposure to plasma and gas (10 mTorr).
- Sample temperatures up to 850 °C.
- Sputtering yield measurements for pure and multicomponent materials (more on next slide).
- Strain measurements using laser reticule (MOSS)

Sputtering measurements on multi-atom targets

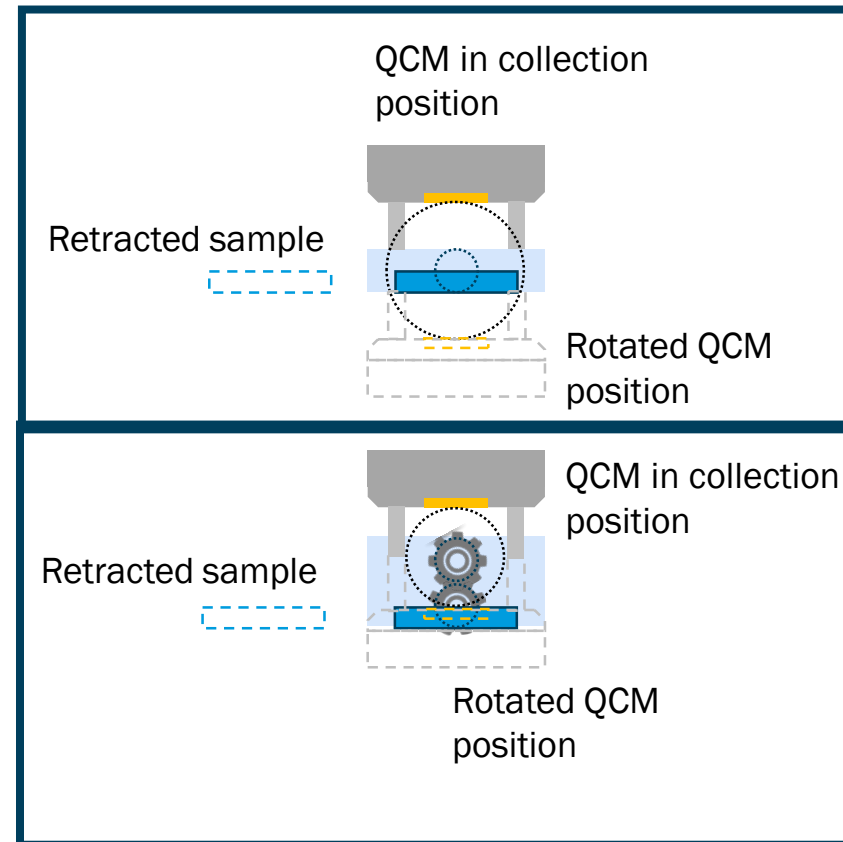
- A very relevant example for DIII-D is SiC.
- Questions:
 - Are Si and C partial sputter yields known? Are angular sputter distributions known? Are they the same for both Si and C?
 - How does the sputter yield change with temperature?
 - How is SiC surface composition evolving during ion bombardment?
- Some of these questions can be answered on IGNIS-2!

RAMPSY

- Rotating Assembly for Measurement of Partial Sputtering Yield



Successfully implemented on IMPACT in 2004, but never formally documented



Current line of sight rotating feedthrough does not allow positioning crystal on analysis position

Shifting the rotating axis using a set of gears allows positioning crystal on analysis position

RAMPSY Design