



Witness plate outgassing update in Albany SEMATECH and CNSE

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IEUVI Resist TWG, Brussels

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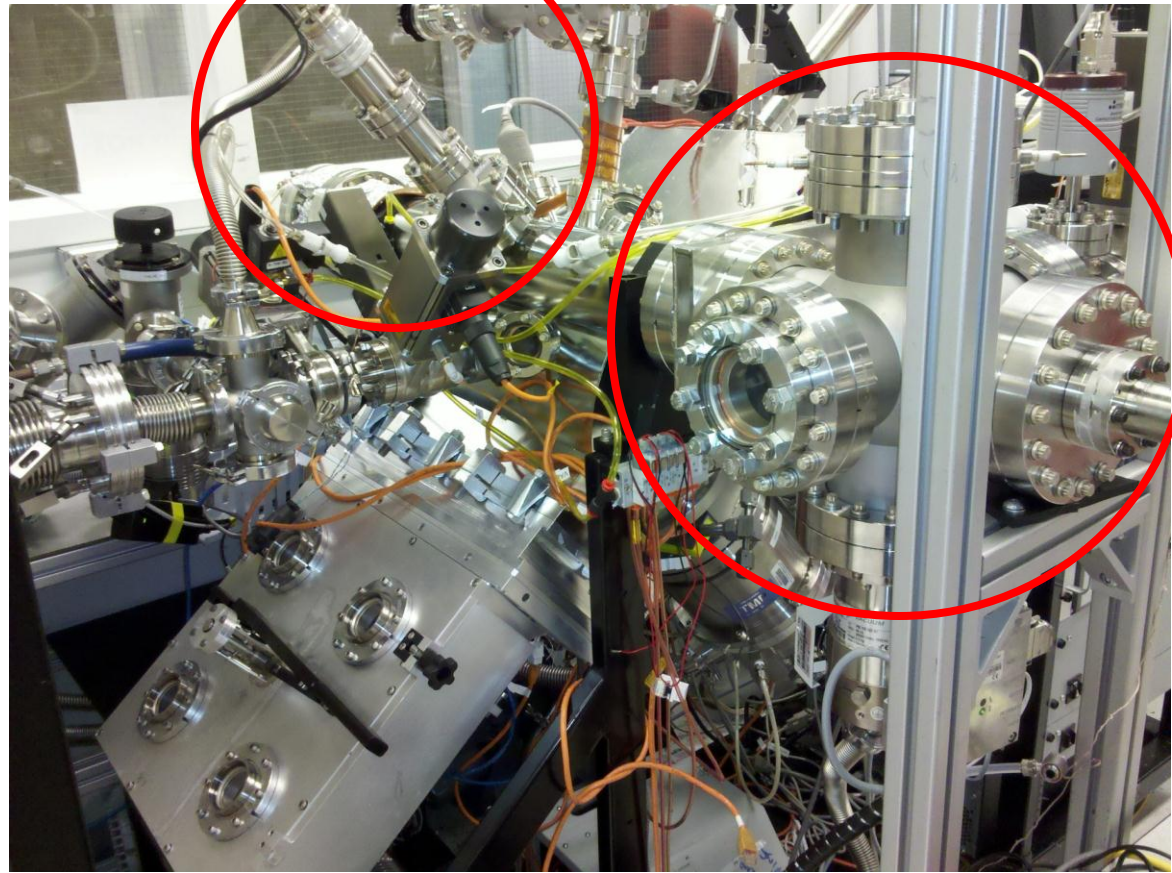
*Special thanks to Noreen Harned and Jennifer Massier of ASML for
technical guidance and support*





Adapted the ROX tool for ASML witness plate requirements

- Installed and aligned electron gun
- Added witness plate loadlock transfer system
- Added witness plate cleaning
- Plasma cleaned chamber
- Obtained access to XPS
- Obtained access to ellipsometry
- Upgraded system components
- Optimized control system



Hybrid system – EUV exposures of resist and electron exposures of witness plate



Status

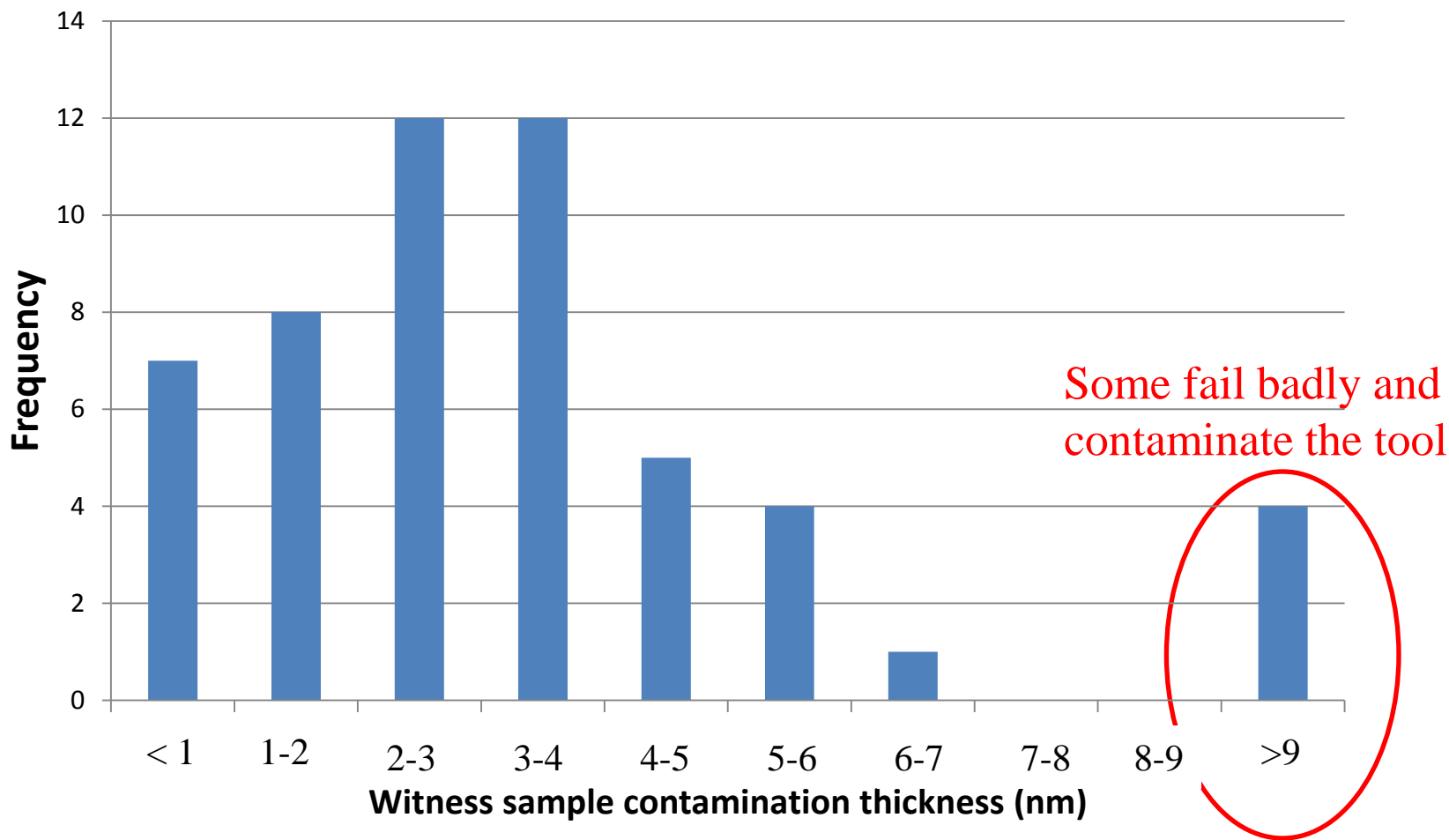
- Testing customer resists since April
- Completed testing of more than 50 customer resists
 - This is a huge amount of effort and SEMATECH has performed almost all of this testing
- Average about 2 customer resists per week – but moving forward to improve throughput

See Chandra Sarma's talk at the EUVL Symposium for a full update on status and plans

Wednesday, 14:40-15:00

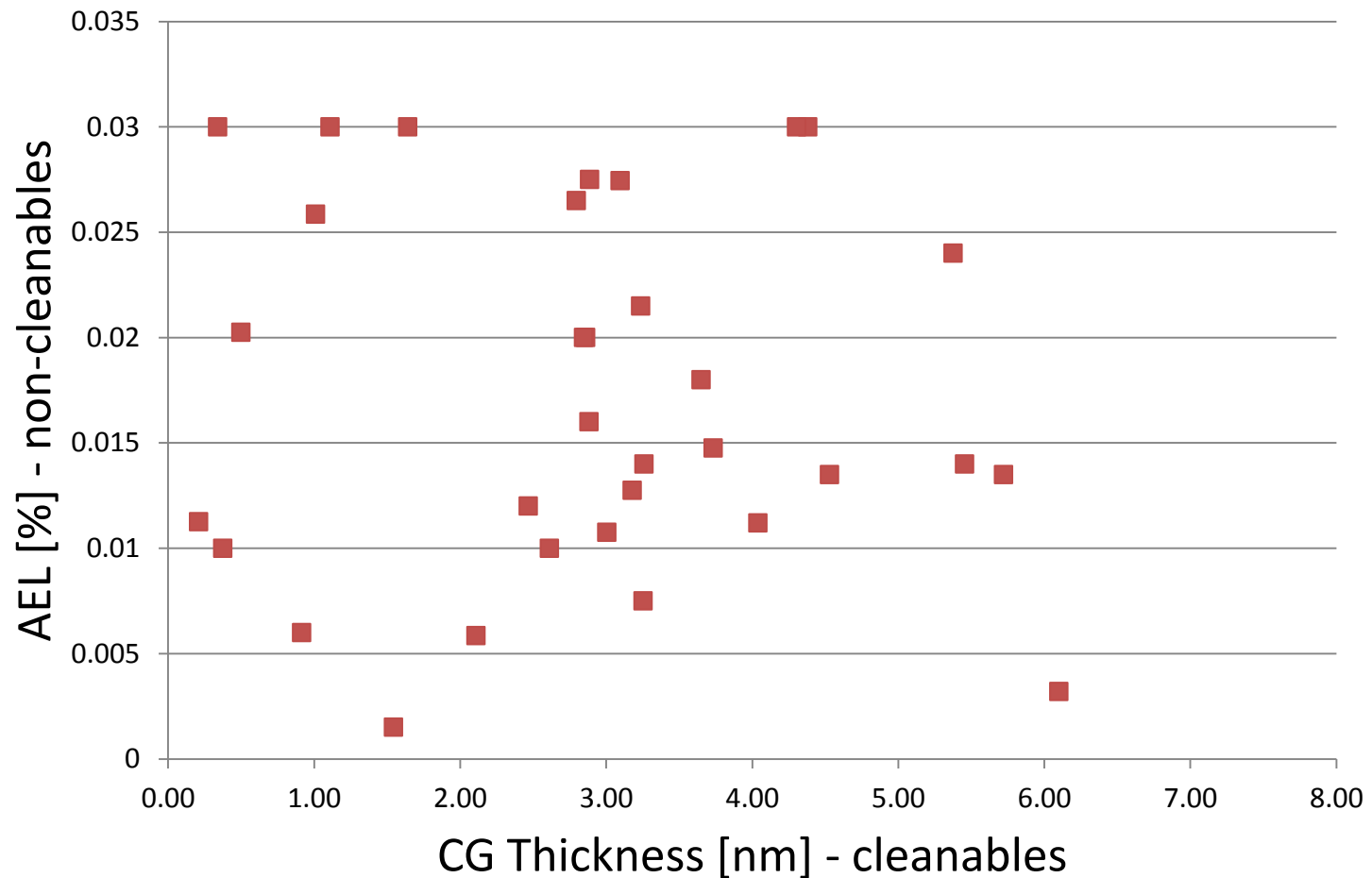


Cleanables results



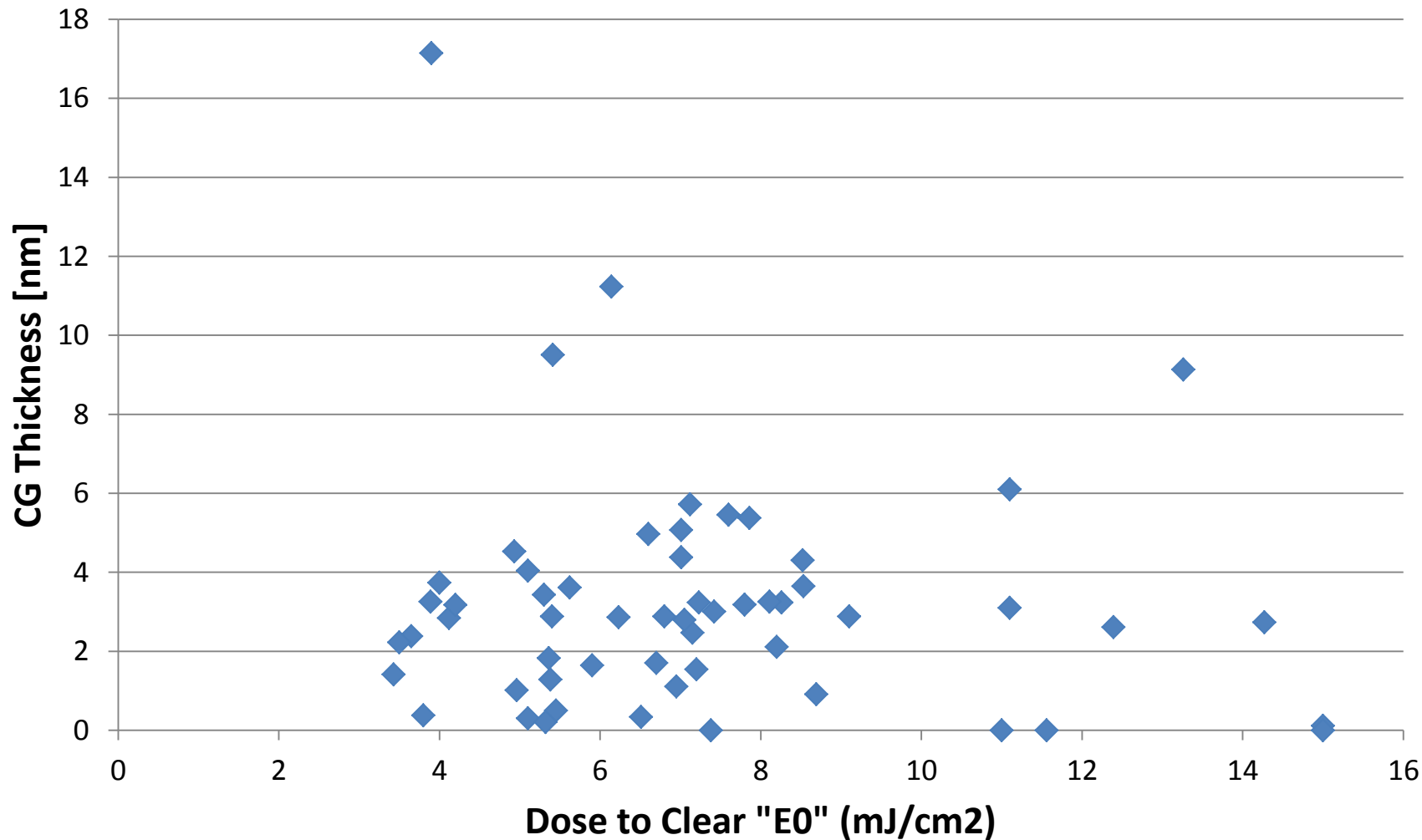


No clear trend between cleanable thickness and non-cleanable result



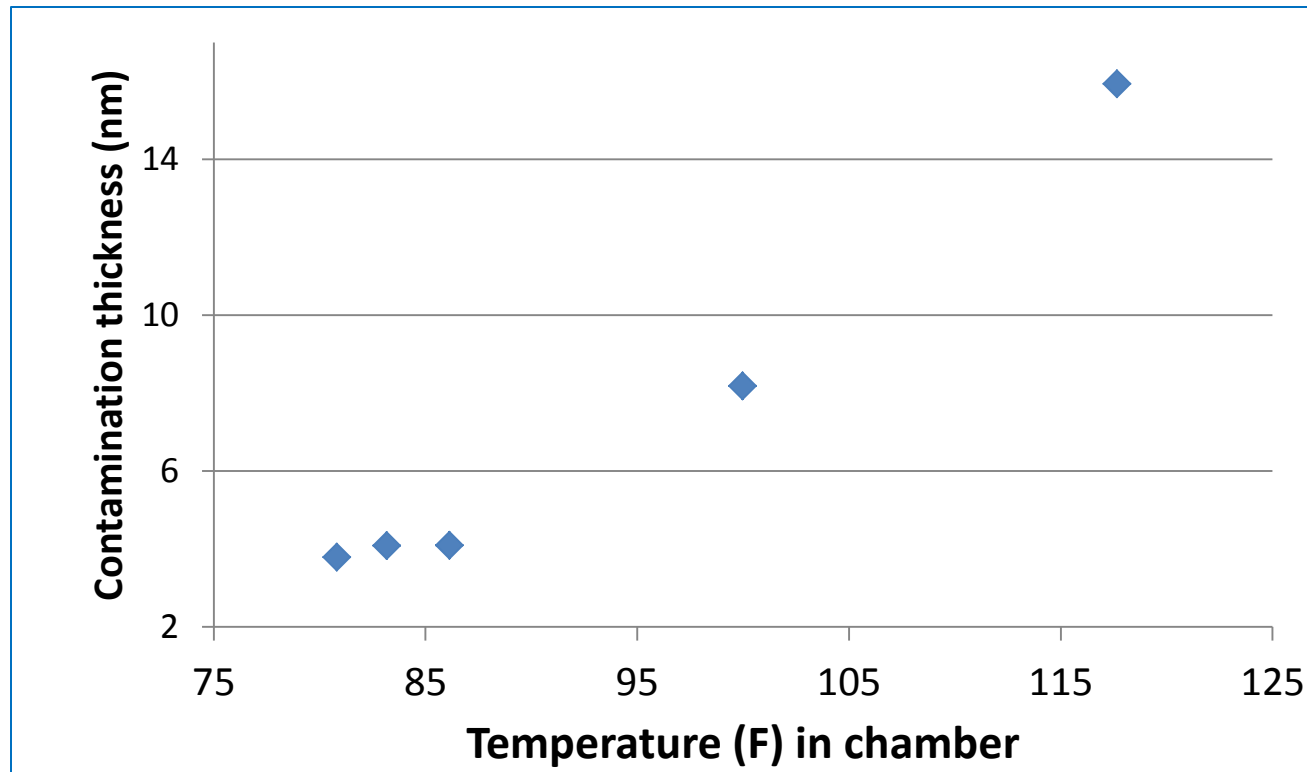


Cleanables thickness versus E0

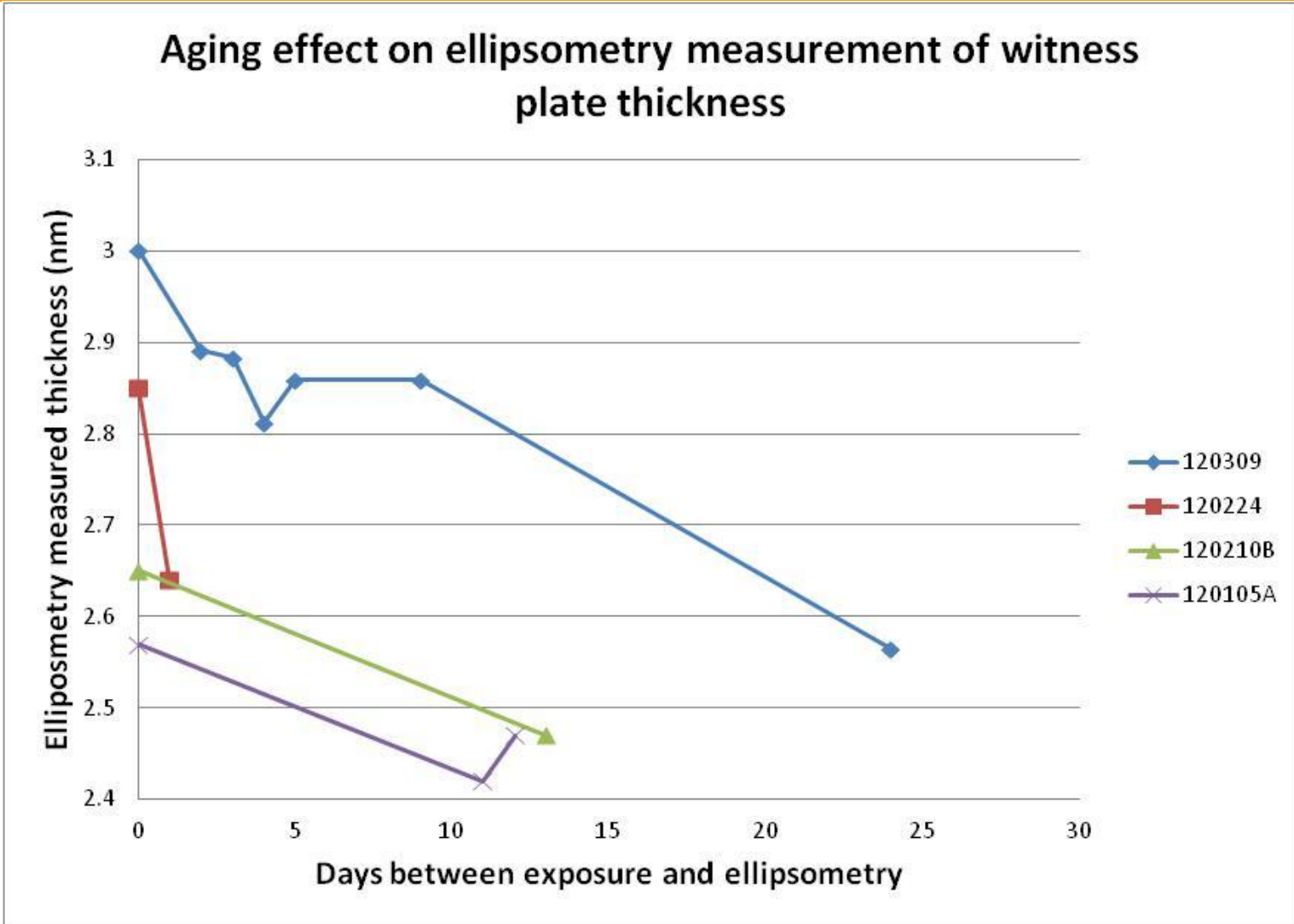




Temperature dependence



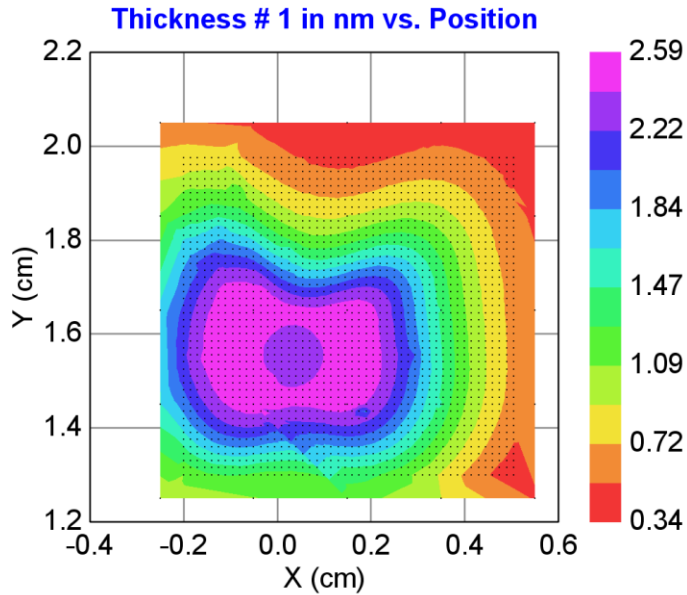
- Intentionally raising the temperature of the chamber with external heater tape increased the measured contamination thickness
- Indicates temperature stability of tool may be required



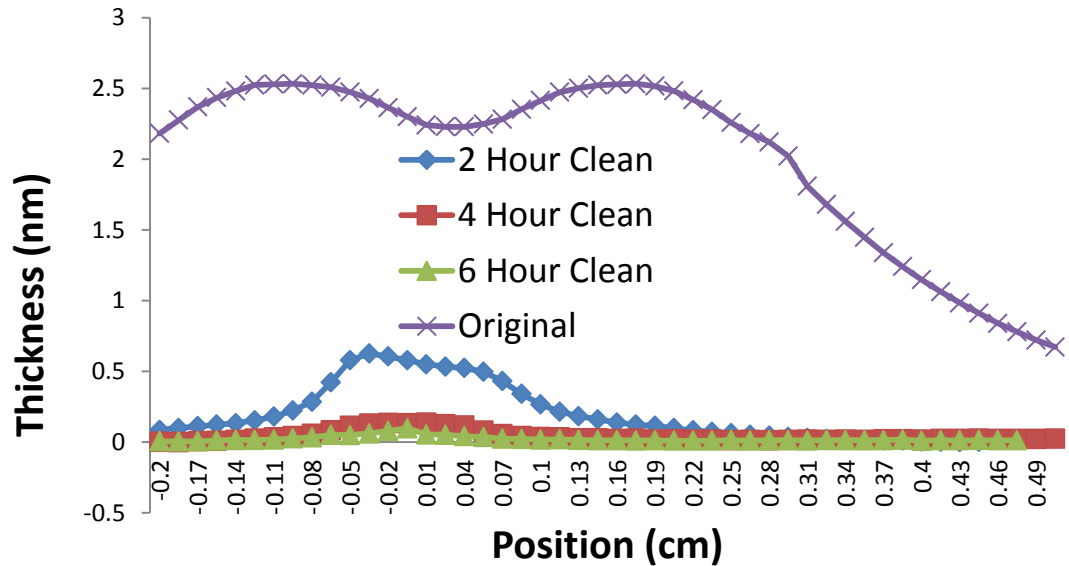
We measure about 5% lower result after each week of aging
Same day measurements are part of our process flow



Contamination size, shape and cleanability



Approximately 1 mm FWHM electron spot gives flat top much wider, and dip in center due to higher exposure dose affecting ellipsometry measurement (density or composition?)

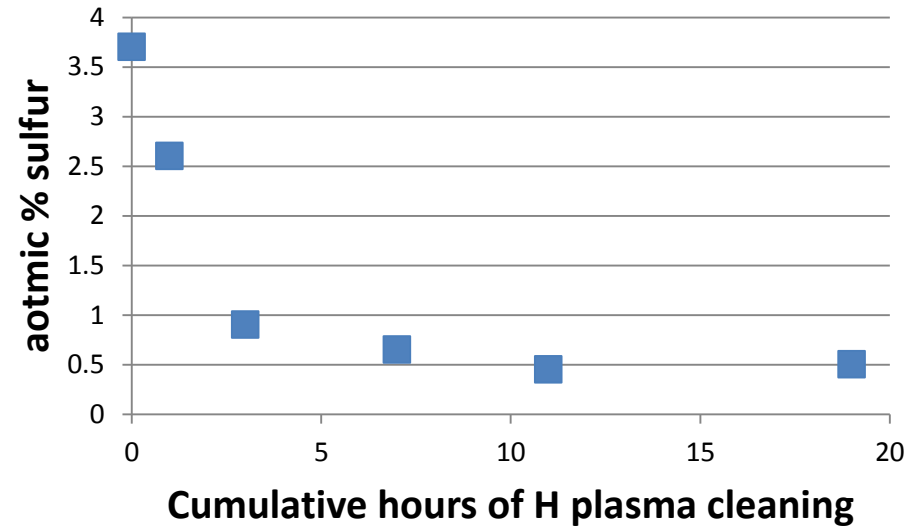


- Cleaning rate at center is slower than lower dose regions
- Cleaning rate is non-linear – harder to clean contamination closer to the witness plate surface
- We clean long enough to remove measurable contamination



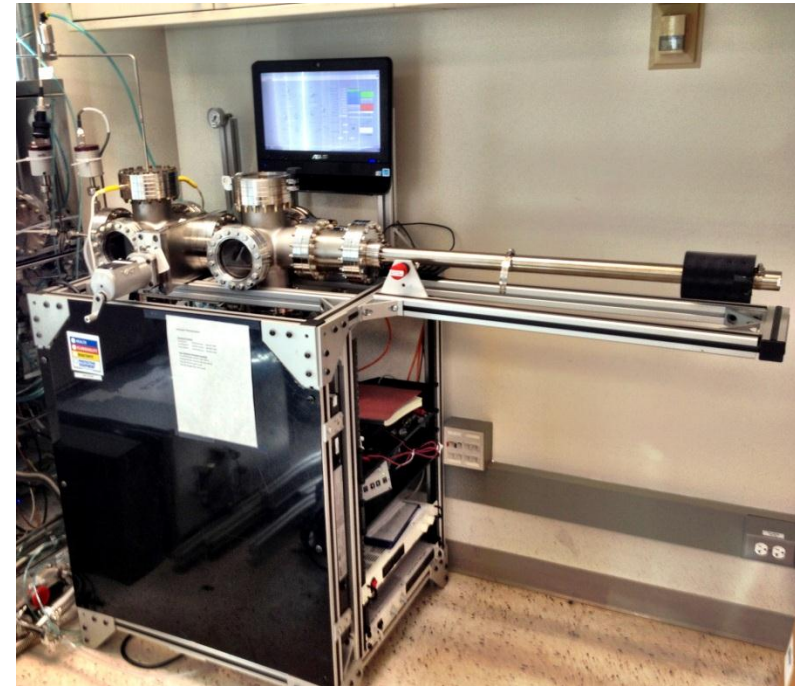
Second hydrogen cleaner had sulfur contamination problem – but it was solved by plasma cleaning

Cleanliness of new CNSE hydrogen cleaner after
glow discharge hydrogen plasma cleaning



Custom glow discharge hydrogen plasma
cleaning solved sulfur contamination in
chamber

Measurement is XPS sulfur composition
from witness plate after 1 nm of cleaning





SEMATECH's EUV Technology outgas testing tool has been installed

Currently undergoing certification

