

EUVL source critical component lifetimes

- **Issues**
 - **Which component lifetimes are critical?**
 - **Plasma facing condenser**
 - **All plasma facing components ←**
 - **SPF lifetime**
 - **Everything up to IF**
 - **Dose measurement component – all metrology**

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- **Issues**
 - **What are fundamental mechanisms?**
 - **Fundamental physics understanding of mechanisms**
 - **Ion milling vs. plasma etching vs. melting vs. ?**
 - **Species, rates, energetics,**
 - **atomic vs. macroscopic**
 - **Thermal mechanisms**
 - **Erosion vs. deposition**
 - **Near normal mirrors and grazing incidence mirrors**

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- **Issues**
 - **Common metrology for measurements**
 - **Normalize by flux**
 - **Total or EUV in band?**
 - **Common measurement environment**
 - **Backgrounds**
 - **Distance**
 - **Exposure: Common EUV power – threshold effects**
 - **Ion energy spectrum at mirror location for normalization**
 - **At fixed EUV output**

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- **Issues**
 - **Requirements**
 - **COO driven lifetime requirement**
 - **Understand tool chemical environment requirements at IF**
 - **Does mitigation affect tool?**
 - **Tin or another alternate to Xe**
 - **Xe problems will carry over to Sn**
 - **Nail down Xe first – basis for later problem solutions**
 - **Much is common but information needed for tradeoff study**
 - **Modeling efforts**
 - **Plasma physics of source**
 - **Critical component lifetime**
 - **Graceful or catastrophic failure**

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- **Opportunities for collaboration**
 - Round robin data exchanges
- **Who? (Partial list)**
 - CEO
 - Powerlase
 - Innolite
 - Xtreme
 - EUVA
 - Jmar
 - VNL
 - UCF
 - Argonne Natl Lab
 - Cymer
 - Philips
 - Alcatel

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Opportunities for collaboration (Cont)

- **Suppliers of advanced mirror materials**
 - FOM
 - VNL
 - ASET
 - Osmic
 - Univ. Illinois/Argonne
 - Xenocs
 - Grazing incidence condens. Matls.
 - D. Windt/Columbia
- **Electrodes, other matls.**
 - Argonne
 - Others TBD
- **Debris Mitigation devices**
 - Univ. of Illinois

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Opportunities for collaboration (Cont)

- **Analytical Capabilities to support studies (Partial list)**
 - **CREOL/**
 - **Univ. Illinois**
 - **NIST**
 - **VNL**
 - **Argonne**
 - **Canon**
 - **PTB**

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Opportunities for collaboration (Cont)

- **Modeling**
 - **Plasma surface interactions**
 - Argonne
 - VNL
 - Univ. Illinois
 - **Thermal**
 - **Transport**
- **A range of funding opportunities exist**
 - **ISMT/EUVA/MEDEA+**
 - **IC Cos.**
 - **SEMs**

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- **Specific questions to address**
 - **Sputter thresholds for all materials and higher charge states; Xe, Sn, others**
 - **Where is exact cross-over between:**
 - **C vs Oxid.**
 - **Erosion vs Dep**
 - **Linearity vs power, flux, etc**
 - **Effects of buffer gas on mechanisms**
 - **Plasma-induced outgassing of materials**
 - **List of proscribed matls. To avoid**
 - **Thermal outgassing rates of materials**
 - **Radiation-induced outgassing of matls.**
 - **Oxidation rates of Ru, other**