FIRST-EVER MEASUREMENTS OF ION ENERGY DISTRIBUTION FUNCTIONS IN EUV INDUCED PLASMA

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References

Introduction

The EUV sources for ASML’s next-gen lithography tools allow us to investigate EUV induced plasmas, which up to recently, have been exclusively investigated by astronomers. EUV-induced plasmas are of significant importance with respect to the lifetime of components in EUV lithography tools. An important parameter is the ion energy distribution function (IEDF).

For the first time ion energy distribution functions (IEDFs) have been measured in an EUV induced plasma

Surface interactions

IEDFs have been measured with the EQP in parallel and perpendicular configuration. In the perpendicular configuration EUV light hits the EQP sample plate. In the parallel configuration there are no surfaces exposed to EUV.

**Perpendicular**

- Broad distribution
- Energy cut-off at 18 eV
- H⁺ is converted to H₂⁺ by collisions with background: H₂⁺ + H → H + H⁺
- Secondary electrons reduce the Tₑ and Vₑ, thereby reducing the ion energy

**Parallel**

- Bulk has low energy (<5 eV)
- Energy tail up to 22 eV
- H₂⁺ density much lower than H⁺

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Spectral effects

The setup consist of a EUV source, collector vessel and measurement vessel. The EQP can be positioned in multiple configurations. Measurement vessel

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Outlook

- Verify numerical (PIC) models made by D. Astakhov (ISAN, Russia)
- Quantification of ion fluxes to assess EUVL tool lifetime
- Investigate scaling laws to deduce ion dynamics