High CE technology for HVM EUV source

Outline
1. Introduction
2. Engineering Test source
3. 1st Generation integrated setup LPP source
- Operation Data
- Pre pulse optimization
- Debris mitigation mechanism
- Higher CE investigation
4. Summary

Critical issue investigation with 10Hz device
- Double pulse optimization
- Debris mitigation mechanism
- Higher CE investigation

Introduction
- EUV light generated at Proto system

EUV sources
- Double wavelength Laser Produced Plasma
- EUV light generated at Proto system

System operation Data (ETS device)

Summary
- 1st generation integrated setup LPP source
- EUV light generated at Proto system

Higher CE challenge more than 5%
- Small spot size with Dual spot on demand
- Dual wavelength Laser Produced Plasma
- Perfect synchronization and Magnetic mitigation

LPP Device Power vs CO2 Input Power

When will we reach the end of the tunnel?

Experimental Condition:
- Experimental setup
- Power
- Observation

Dual wavelength Laser Produced Plasma

New champion data of CE > 4.7% (Jun.2012)
- After CE optimization
- 3.1% - 5.6% - 6.7% @ pilot condition

New champion data of CE > 4.7% (May 2012)

Droplet Generator on Demand

Low duty cycle demonstration

Mirror position

3 in 1 mode 400 W

Max. 7W clean power within burst

Dose stability: simulation

Mirror position

Droplet generator on demand

Dose stability experiment

Sensitivity

3 mm

100 ± 20 %

CO2 Laser Energy [a.u.]

Mirror position

Droplet generator on demand

LIF image analyzer

Summary

CO2 Laser Main
- Pulse laser + CO2 laser irradiation: Ionized 93% of Tin
- Single pulse laser + CO2 laser: Ionized 93% of Tin

Experimental Condition:
-ining and main ionization make >93% ionization. This optimization: 8KV pulse laser irradiation: ionized 93% of Tin
- Single pulse laser + CO2 laser: Ionized 93% of Tin

Faraday cup

- Velocity [m/s]

500

10

20

100

300

CO2 Laser Energy [a.u.]

Droplet generator on demand

Droplet Generator on Demand

Dose stability experiment

Summary

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Experimental Condition:
- Power
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Dual wavelength Laser Produced Plasma

New champion data of CE > 4.7% (Jun 2012)
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New champion data of CE > 4.7% (May 2012)

Drop in wavelength Laser Produced Plasma

Dose stability experiment

Summary

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1st generation integrated setup LPP source (ETS)
- EUV light generated at Proto device
- Perfect synchronization and Magnetic mitigation

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