COMPACT DISCHARGE BASED EUV SOURCE FOR METROLOGY AND INSPECTION

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Discharge based EUV Source - FS5420

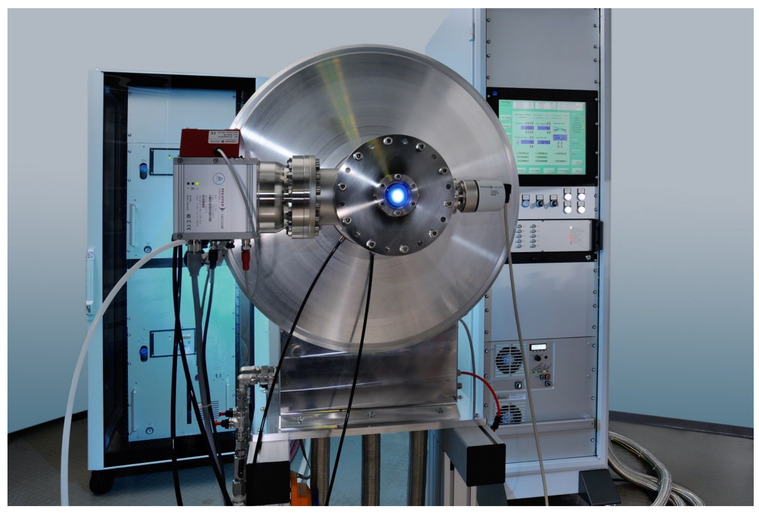


Fig. 1: Discharge source FS5420 (source head, control unit, chillers)

- Optics contamination studies
- Nano-patterning
- Optics characterization
- Resist tests
- Defect inspection
- EUV microscopy

Technical Data

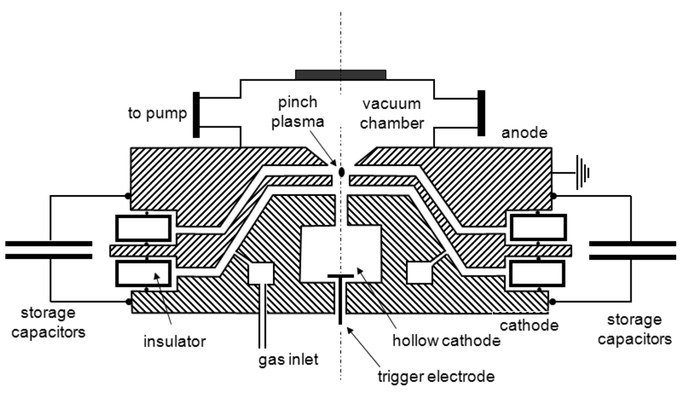


Fig. 2: Scheme of the electrode system

- max. input power: 20 kW
- max. pulse energy: 10 J
- max. repetition rate : 2,5 kHz
- typical plasma length: 3-5 mm
- accessible collection angle: < 90°
- typical Xenon flow: 50 sccm

Multiplexing for Sample Irradiation

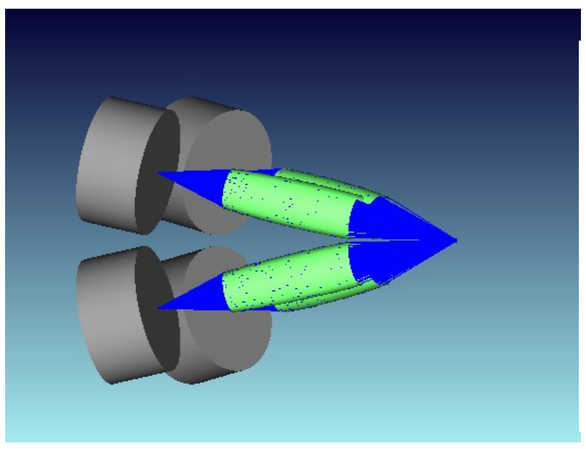
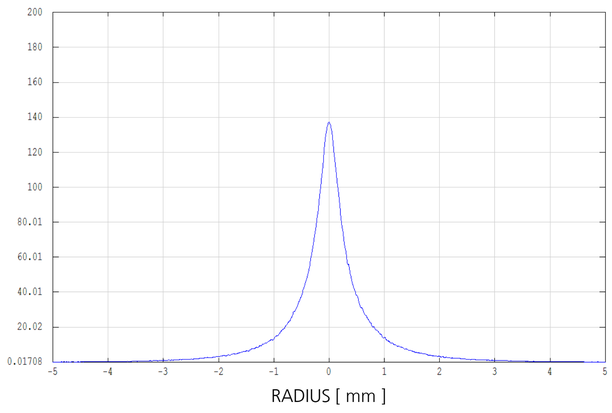


Fig. 3: Ray tracing of SoCoMo with resulting intensity profile at the intermediate focus



Peak intensity at target : **1.4 W/mm²**

- Source parameters for ray tracing (single unit):
  - pulse energy : 3,3 J
  - repetition rate : 1500 Hz
  - electrical input power : 5 kW
  - source diameter (FWHM) : 450 µm
- Collector (ellipsoid):
  - track length : 1500 mm
  - magnification : 1,2
  - cone opening angle at IF : 25°
  - transmission : 80 %

Power Scaling – 40W/2πsr Operation

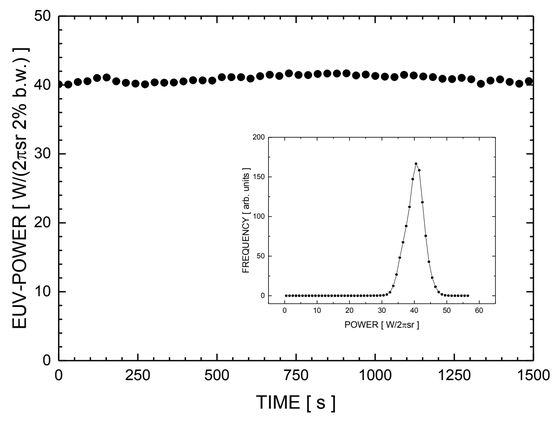


Fig. 4: EUV inband power in a 30 min run

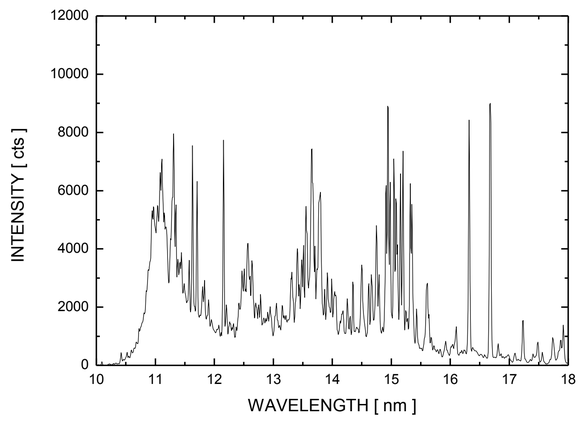


Fig. 5: Typical Xenon emission spectrum

- Average input power 13 kW at 2500 Hz repetition rate
- Peak brilliance : ~ 12 W/mm²sr
- Standard variation (pulse-to-pulse) : σ = 6,9 %

Demonstration of 6.x nm Emission

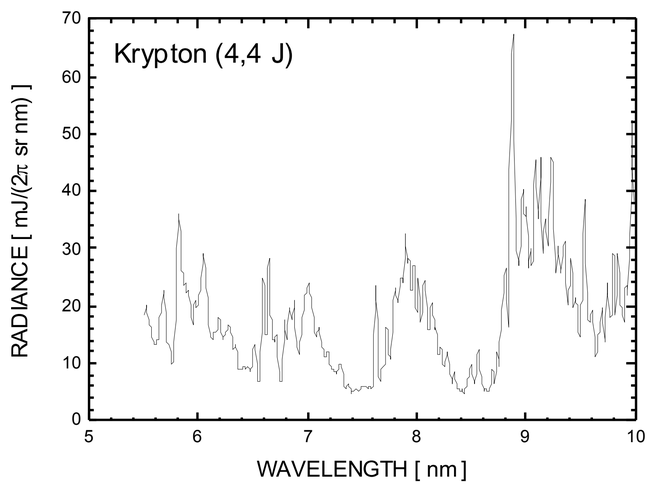


Fig. 6: Emission spectrum of Krypton 4,4 J at 1 kHz repetition rate

- Contributions from 4d-4f transitions around KrX
- Emission between 6–7 nm at 4,4 kW input power: ~ 15 W/2πsr
- Suitable for irradiation damage studies or optics characterization

Application tailored Features

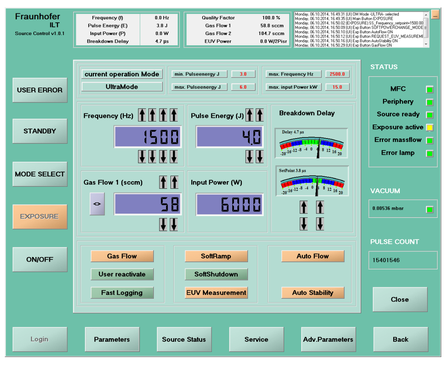


Fig. 7: User Interface

- Full PLC automation
- Pulse-to-Pulse control
- Dose control
- Active feedback loop control
- Remote controls

Performance Data

- FS5420 Standard Operation
  - Inband power : **20 W/2πsr**
  - EUV pulse energy : 2,2 mJ/sr
  - Repetition rate : 1500 Hz
  - Peak brightness : 8 W/mm2sr
- High Pulse Energy Option
  - Inband power : <10 W/2πsr
  - EUV pulse energy : **> 4,0 mJ/sr**
  - Repetition rate : < 400 Hz

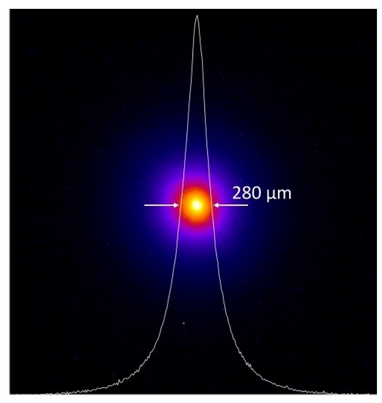


Fig. 8: Intensity profile at 13,5 nm (end-on)

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