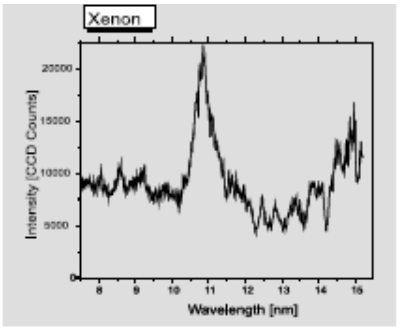
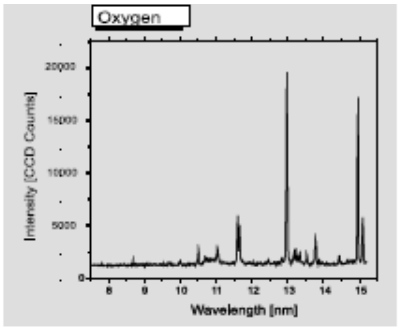
Table-Top EUV Source

A laser-based plasma source for the generation of EUV radiation at 13 nm has been developed in the LLG.

The EUV emitting plasma is produced with the help of a Nd:YAG laser (Innolas, 1064 nm, 750 nm, 6 ns) that is focused into a pulsed gas jet. The alternate use of xenon or oxygen as target gas accomplished either an intense broad-band or a less intense narrow-band line emission at respectively 13 nm.





The system can be used for metrology, the characterization of EUV optics and sensory devices or for fundamental investigations on material interaction, just to give some examples.

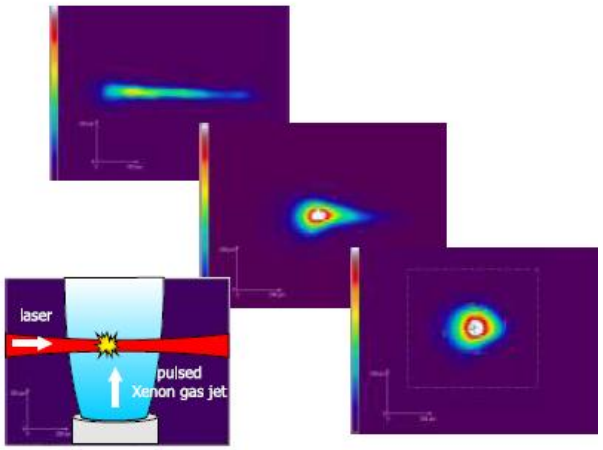
Specifications

- **Wavelength (Xe target):** 7 - 20nm
- **Pulse energy:** 3.5mJ (4πsr, 2%BW)
- **Conversion eff. (Xe):** 0.45%
- **Pulse length:** 6ns
- **Plasma shape:** nearly spherical, 300µm
- **Pulse-to-pulse-stability:** 10%
- **Positional stability:** 10%

▶ **Advantages**
- High EUV energy (3.5mJ)
- Minimum gas consumption (gas pulse: 1ms)
- Table- top system

▶ **Applications**
- Metrology
- Optics testing
- Fundamental studies on material interaction

▶ **EUV plasma monitored with a pinhole camera for different positions of the laser focus:**



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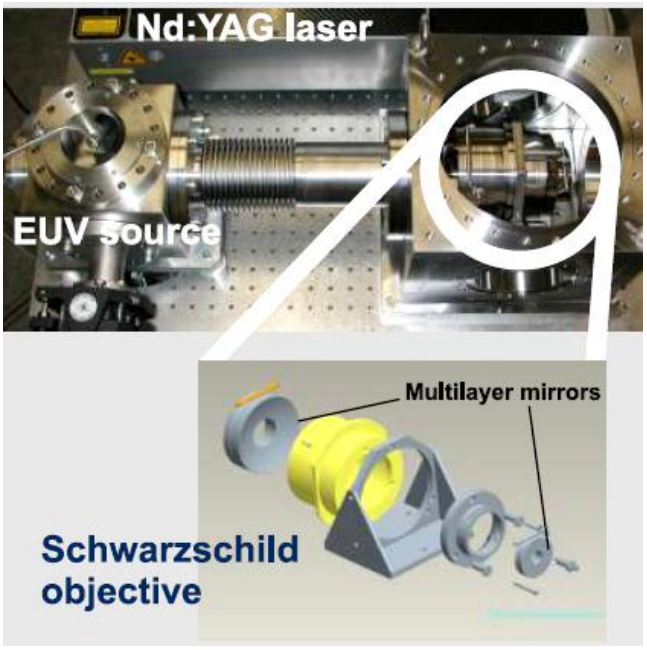
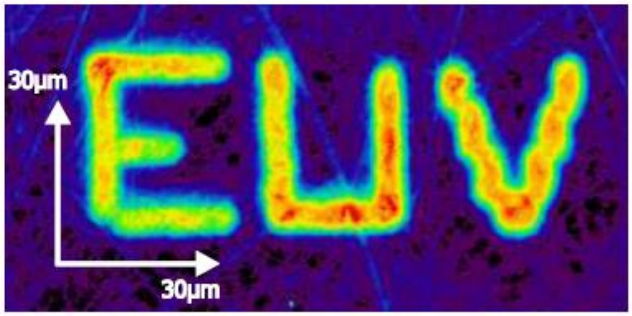
EUV Schwarzschild Objective

Within the scope of BMBF project KOMPASS, a modified Schwarzschild objective for 13.5 nm was designed and adapted to the table-top EUV source. The optic consists of two spherical ULE substrates mounted in a separate vacuum chamber, providing a numerical aperture of 0.44 and a demagnification factor of 10 with respect to the plasma source. The substrates were coated with high reflectivity Mo/Si multilayers by Fraunhofer IOF/Jena.

With the help of this compact EUV source and optics system, a focal spot with a diameter < 30 µm at energy densities of several mJ/cm2 can be generated. With the use of mask projection, a direct structuring of different materials is possible this way. One example is the direct writing of color centers in LiF crystals with a spot size of 5 µm.





▶ Direct writing of colour centres in LiF crystal by raster-scanning an EUV spot (5 µm diameter)

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