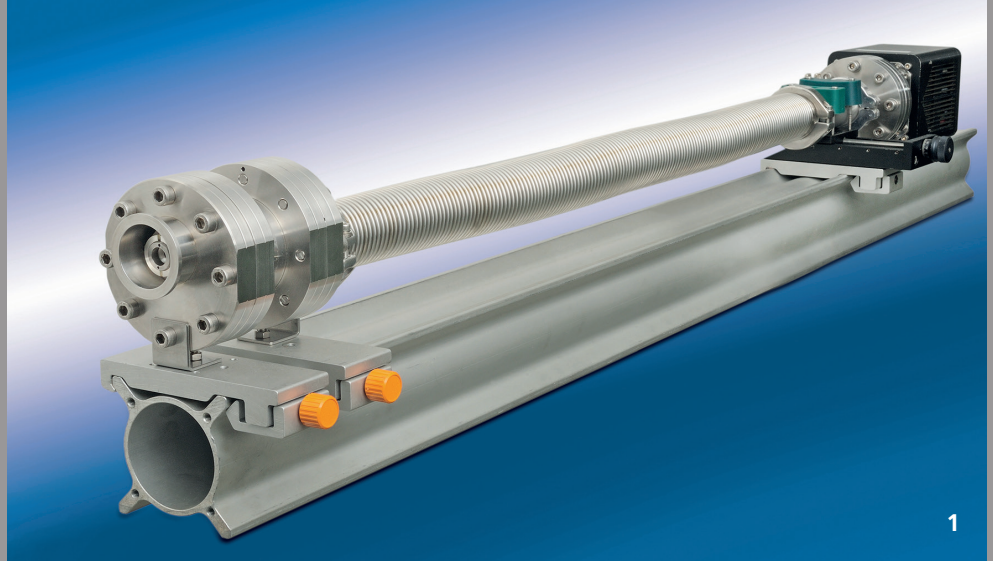

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METROLOGY FOR CHARACTERIZATION OF RADIATION SOURCES AT A WAVELENGTH OF 6.7 NM

Task

For the production of future semiconductor devices, lithography is commonly discussed at an operating wavelength of 6 - 7 nm (6.x nm). Hot plasmas are suitable as radiation sources both for the production of the chips as well as for the accompanying metrology of this technology. To characterize these sources, however, a measurement technology is required for both the absolute photon flux as well as for the spatial extent of the sources. In particular, for laser-induced plasmas, it is a challenge to determine the source size with a resolution of a few microns at the central wavelength.

Method

In collaboration with the Fraunhofer Institute for Optics and Precision Engineering in Jena, Fraunhofer ILT designed and implemented different imaging systems on the basis of lanthanum-boron carbide-based multilayer mirrors. As detectors, both sensitive CCD cameras and fluorescent screens can be used. During construction, particular attention was placed on the system's suitability for daily use in the laboratory: i.e. an acceptable length of the setup with a large working distance to the plasma and sufficient magnification.

Result

Two systems have been built, each with a magnification of up to M = 3 and M = 9 and with which a spatial resolution in the range of a few microns can be achieved. The M = 3 system consists of a flat and a spherical mirror, and the M = 9 system consists of two spherical mirrors in a Schwarzschild lens arrangement. These setups guarantee a small total length of about 1.5 m at a distance from the plasma of about 40 cm, at the highest possible magnification.

Applications

The cameras can generally be used not only in the area of 6.x nm lithography, but also to spatial characterize radiation sources. When multilayer mirrors are exchanged with the correspondingly adjusted layer system, the setup can be adapted to other wavelengths.

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1 High-resolution camera for a center wavelength of 6.7 nm.