2 SOFT X-RAY RADIOMETRY BEAMLINE

2.1 Optical scheme

Two plane grating monochromator beamlines in the PTB laboratory at BESSY II can be used for radiometry in the EUV spectral range. To optimize the beamlines for radiometry, special emphasis was put above all on maximum suppression of higher diffraction order radiation and high radiant power rather than on maximum energy resolution. Secondly, a high reproducibility of the photon flux and tunability of the photon energy is needed.

Most radiometric measurements are basically comparisons of different detector signals, for example the calibration of detectors by comparison with a reference detector, or reflectometry by comparison of the signal in the direct and reflected beam. As such measurements are performed in succession, a stable radiation is needed. A storage ring, however, usually is not a stable source because the stored electron current decreases with time. Our solution is to normalize the measured intensities to the stored ring current. High stability of the monochromator throughput is therefore requested.

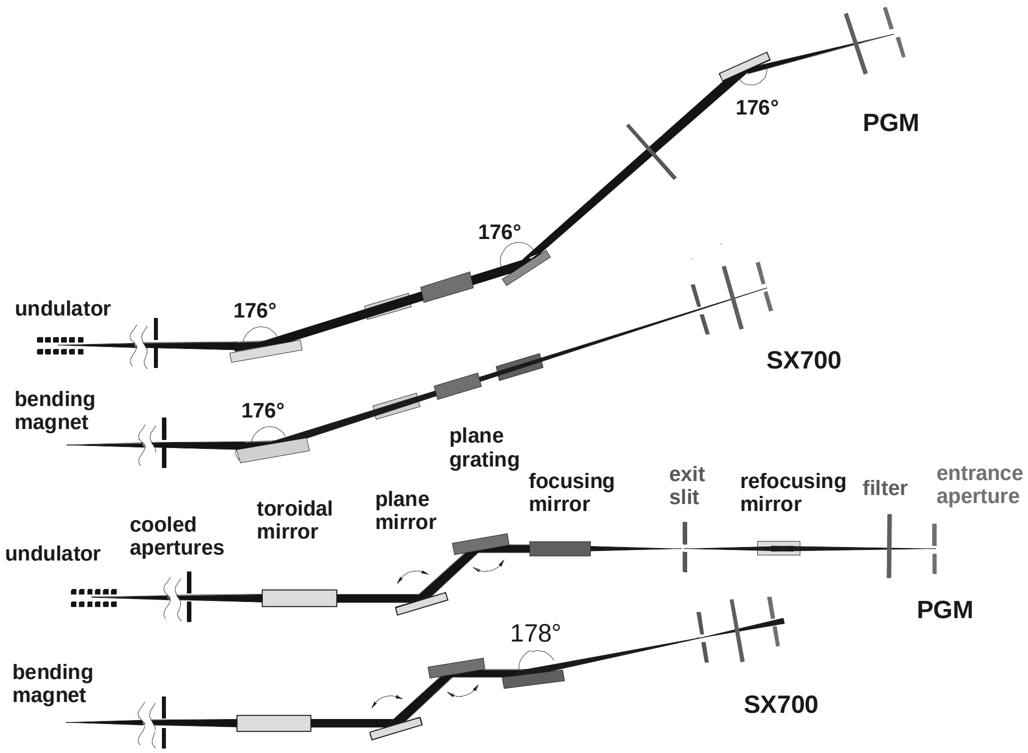

Figure 1 Scheme of the plane grating monochromator beamlines for EUV radiation in the PTB radiometry laboratory at BESSY II (top: top view, bottom: side view):
At both beamlines, cooled apertures are used to define the incident beam. The first optical component is a water-cooled toroidal mirror, horizontally deflecting at a grazing angle of 2°. It collimates vertically. The next elements are the plane mirror and plane grating followed by a mirror which focuses vertically onto the exit slit.
At the undulator beamline (PGM), a toroidal mirror is placed behind the exit slit for horizontal focusing and vertical refocusing.
At the soft X-ray radiometry beamline, at a bending magnet (SX700), horizontal focusing is achieved also by the first mirror.
The last elements shown in the scheme are the higher-order suppression filters and the entrance aperture (AP1) of the reflectometer.

For the soft X-ray radiometry beamline, the incoming flux is defined by the setting of cooled apertures in front of the first mirror, see Figure 1. The natural opening angle of the SR is much wider than that aperture, which has a maximum opening of 5 mm vertically and 32 mm horizontally. Any residual movements of the SR source and changes of direction (by less than 10 µm) therefore do not have any influence. None of the optical elements arranged behind or none of the apertures cuts the