coherency radiation limits the number of periods of the grating that interfere destructively and, consequently, results in the reduction of the interference contrast. For our measurement scheme this has led to the increase of $R_{\min}$. The application of diaphragms for angular filtering required in our specific case also results in the reduction of the illumination spot size and consequently reduction of the number of the grating periods involved in the formation of the diffraction pattern. In the case of illumination of the described diffractive filter with the scattered CO_2 laser radiation in EUV sources we expect the suppression rate of the 0th order reflectance to be closer to our theoretical estimations due to the larger coherence length. If stronger suppression is needed, a possible way to meet this requirement is to increase the period of the structure.

Conclusions

We have developed a special combination of a high-reflectance multilayer mirror for EUV radiation and a lamellar grating substrate that provides spectrally selective suppression of longer-wavelength radiation. This suppression of the long-wavelength specular reflectance occurs due to quarter-wavelength phase-shift resonance. It is not affecting the high reflectance of the multilayer structure for EUV light. This system allows for example the suppression of unwanted radiation from laser plasma-based EUV and soft X-ray sources, having an undesired component of scattered IR laser radiation. Such spectral filtering is of high importance for emerging lithographic applications, high harmonic generation systems and water window microscopy.

A test mirror has been fabricated using a contact mask deposition of the grating substrate followed by the deposition of a Mo/Si multilayer designed for normal incidence reflectance at $\lambda = 13.5$ nm. The grating has been optimized for mid-IR suppression. A factor of 70 reduction has been experimentally demonstrated at 9.7 μm wavelength together with 61% EUV peak reflectance at 13.5 nm wavelength at near normal incidence.

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