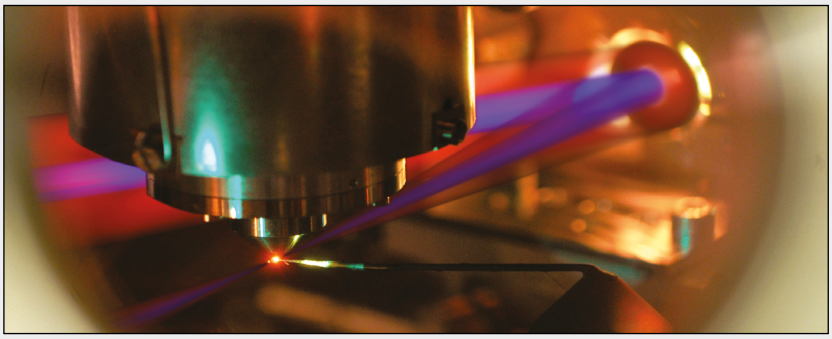
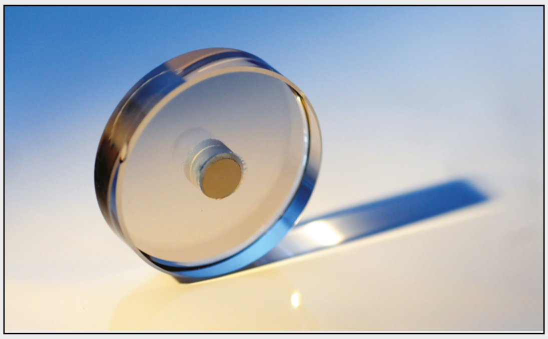
UltraFast Innovations

YOUR KEY to innovation and success

XUV/Soft X-ray Multilayer Mirrors





XUV (Extreme Ultraviolet)/Soft X-ray multilayer mirrors specifically adapted to the experimental parameters and needs are key components for e.g. attosecond pulse generation and shaping based on the High-Harmonic Generation (HHG) process, Free Electron Lasers (FELs) or other ambitious (quantum) optical setups.
Our design know-how and application experience gained through a strong collaboration with numerous scientists within these fields allows us to provide custom support for the planning of your setup and the realization of advanced unique experiments.
Advanced simulation and optimization of the amplitude and phase characteristics of the multilayer mirrors precedes the coating process and atomic precision ion beam deposition provides the required high accuracy for (atomically) thin coating layers. The realization of multilayer optics for steering, spectral filtering and dispersion control of (sub-) femtosecond XUV/soft X-ray pulses are based on broadband (a-)periodic multilayer systems of binary or ternary stacks of nanolayers, with atomically smooth interfaces, of various materials, with layer thicknesses ranging from 1 to 10 nm and layer numbers ranging from ≈ 10 up to ≈ 1000.
Please see reference [1] and [2] for more details).

Key Product Features:

- Large wavelength coverage
  - VUV/XUV: 18 eV-120 eV (10 nm-70 nm)
  - Soft X-ray: 120 eV-400 eV (3 nm-10 nm)
- Customized center energy
- Customized bandwidth (corresponds to pulse duration support)
- Aperiodic/Chirped design possible (tailor-made specifications)
- **Most flat and spherical focusing substrates available on stock**
- **Special substrate shapes** (e.g. double mirror, rectangle) **possible upon request**
- **Tailored design for your experimental needs**

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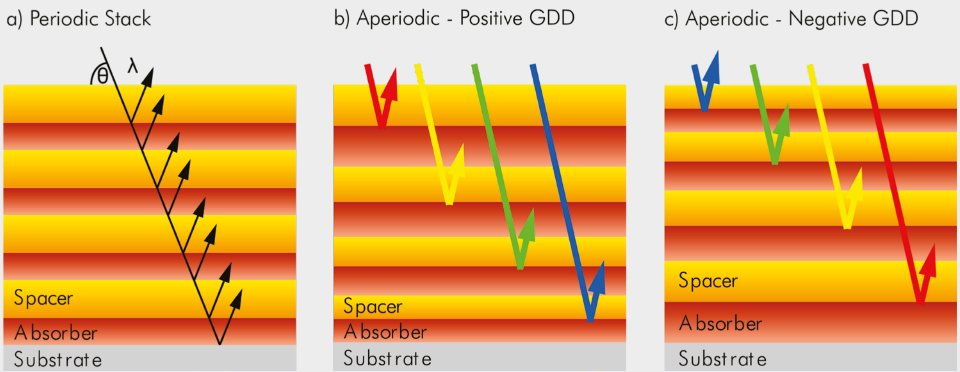
Working Principle:

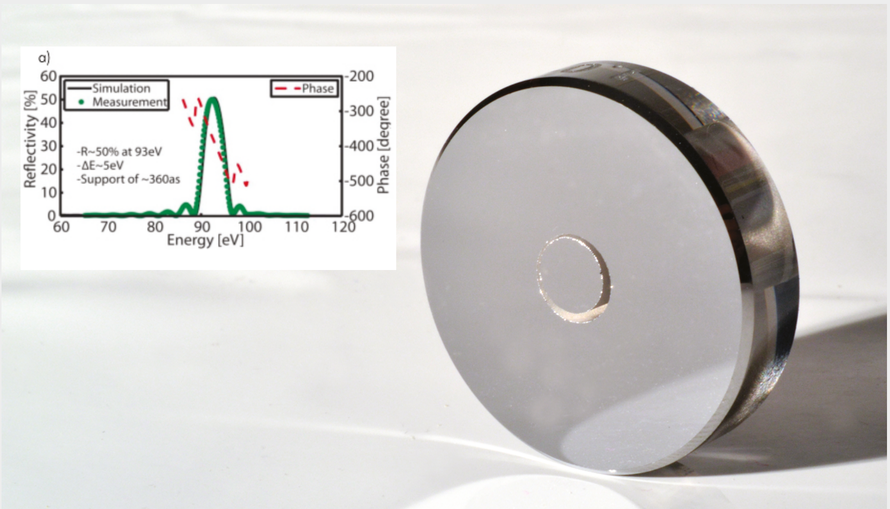
The physical principle of XUV/Soft X-ray multilayer mirrors is based on the interference of scattered/reflected XUV/Soft X-ray radiation from each interface of a multilayer stack. The stack consists of metal or dielectric layers dependent on the spectral region of interest.



Different multilayer stack designs. a) Physical principle of a XUV/soft X-ray multilayer mirror for a periodic design (nearly gaussian reflectivity and chirp free spectral phase). Phase corrections can be realized with aperiodic designs introducing a (b) positive or (c) negative group delay dispersion (GDD).

These designs allow us to control the temporal and spectral properties of the pulses in the XUV/soft X-ray range upon reflection from the optics with very high precision in terms of wavelength/energy, spectral phase and high efficiency [2]. The maximum reflectivity, bandwidth and central energy is dependent on your requirements but can be addressed in the photon energy range from 18 eV (XUV) up to the soft X-ray water window at 400 eV.

Sample Measurement:



Measurement example and our Double Mirror. a) Simulation and XUV reflectivity measurement, together with the simulated phase evolution, for the XUV93eV-BW5eV mirror design, supporting ≈ 360 as pulses. b) Image of a coated XUV double mirror with a core diameter of 5 mm for e.g. IR/XUV time delay experiments being used for attosecond streaking (please see Application Note and our Delay Unit device K2).

References:

[1] M. Hofstetter et al., "Attosecond dispersion control by extreme ultraviolet multilayer mirrors," Optics Express 19(3), 1767 1776 (2011).

[2] A. Guggenmos et al., "Aperiodic CrSc multilayer mirrors for attosecond water window pulses," Optics Express 21(19), 21728 21740 (2013).