Application Note for XUV Multilayer Mirrors

Generation of isolated 80 attosecond pulses

(a) Simulated (black) and measured (green crosses) reflectivity of a 32 eV (FWHM) bandwidth flat phase (red dash dotted) multilayer mirror revealing a measured 3.6% reflectivity centered at 70eV. Together with a 300 nm thick zirconium (Zr) filter (yellow dotted) it functions as a 25 eV broad bandpass and compressor (blue dashed) for the generation of 80 as XUV pulses. (b) Picture of the coated XUV double mirror with a core diameter of 5 mm for introducing the necessary IR/XUV time delay for attosecond photoelectron streaking. (c) Measured photoelectron streaking trace as a function of the delay between the attosecond XUV pulse and the streaking infrared (IR) pulse (taken from [1]).

XUV Multilayer mirrors are key optical elements in attosecond beamlines for steering, focusing and shaping attosecond pulses. In this experiment a broadband multilayer (double) mirror has been used in an attosecond photoelectron streaking experiment to generate and measure isolated pulses with a temporal duration of 80 as (Guinness World Records entry) at 80 eV photon energy. The characteristics of the mirror are shown in the upper figure under (a) and the final XUV coated double mirror in (b). (c) shows the measured attosecond photoelectron streaking trace. The retrieved temporal intensity profile and spectral phase of the XUV pulse are depicted in the left figure (taken from [1]). The pulse duration of 80±5 as is close to its Fourier limit of 75 as, with a small positive chirp being responsible for the deviation. The shortest flashes of light at that time, the key to innovation and success.

Reference: