Abstract Submitted
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**XUV refractive optics** BERND SCHUETTE, LORENZ DRESCHER, OLEG KORNILOV, TOBIAS WITTING, GEERT REITSMA, JOCHEN MIKOSCH, MARC VRAKKING, Max-Born-Institut — Refractive lenses and prisms are indispensable tools used to control the properties of light beams at visible, infrared and ultraviolet wavelengths. It is therefore desirable to develop XUV refractive lenses, which is, however, hindered by the strong absorption in this spectral region. Here we demonstrate control over the refraction of XUV pulses using a gas jet with a density gradient across the XUV beam profile. In a first set of experiments, a gas-phase prism is demonstrated that leads to deflection of broadband attosecond pulse trains according to the frequency-dependent refractive index in the XUV regime. The observed deflection of XUV radiation is particularly large in the vicinity of atomic resonances. In a second set of experiments, we exploit this deflection to demonstrate a gas-phase XUV refractive lens, which allows us to focus narrowband HHG pulses. The focal length can be controlled by varying the gas type and the gas pressure. In comparison to reflective mirrors that are used to focus XUV pulses, our gas-phase lens provides further advantages, as it preserves the XUV propagation direction and is immune to damage. In combination with a Fresnel zone plate, XUV refractive lenses may be used to focus attosecond pulses to nanometer spot sizes.

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