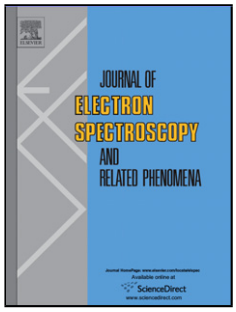

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Dichroism in the photoionisation of atoms at XUV free-electron lasers

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Abstract.

Two-color photoionization of atomic He has been investigated by angle-resolved electron spectroscopy. The combined action of intense radiation pulses from the XUV free-electron laser (FEL), FERMI or FLASH, and a synchronized optical laser on the target atom gives rise to a rich sideband structure in the photoemission spectrum. Measurements of the angular distribution parameters and the determination of the circular and linear dichroism for the two-color photoionization enable a detailed analysis of the symmetry of the outgoing electron waves and of the dynamics underlying the multi-photon processes. The experimental results are in excellent agreement with theoretical results obtained using perturbation theory (low intensity regime) and the strong field approximation. For the particular case of two-photon ionization the measurements represent an ideal tool for characterizing certain FEL parameters, here for example the degree and the sign of circular polarization. Finally, new features of the dichroism are theoretically predicted originating from the non-dipole contribution into the photoionization amplitudes.

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