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Electronic and Lattice Dynamics from Attosecond soft-X-ray Spectroscopy JENS BIEGERT, THEMISTOKLIS SIDIROPOULOS, NICOLA DIPALO, ICFO-The Institute of Photonic Sciences, DANIEL RIVAS, European XFEL GmbH, STEFANO SEVERINO, MAURIZIO REDUZZI, BARBARA BUADES, ICFO-The Institute of Photonic Sciences, THOMAS DANZ, CLAUS ROPERS, 4th Physical Institute - Solids and Nanostructures, Univ. of Gttingen, YVES JOLY, Institut Nel, CNRS, RALPH ERNSTORFER, MARTIN WOLF, Fritz Haber Institute of the Max Planck Society — Time resolving photo-induced structural changes in matter, requires the tracking of initial electronic excitations and their further connection and impact on the local structure. This is a challenging endeavour, as traditional techniques can only separately address either the electronic dynamics or the changes on the atomic structure. Thus, several different methods are typically combined to gain some understanding of the physics. One has however to be very careful when combining, e.g., frequency domain with time-domain methods as it is by no means guaranteed that the same state of the system is measured. Core-level K-shell X-ray absorption near edge structure spectroscopy (XANES) is a well-established method capable to extract information on the electronic and lattice structure of a material with state selectivity. Combining its capabilities with the temporal resolution provided by attosecond soft X-ray pulses produced via high-harmonic generation (HHG) could thus address this problem. Here, we present such first measurement on graphite which provides simultaneous electronic and structural information with real-time resolution provided by using 165 as soft X-ray pulses at the K-edge of carbon at 284 eV.

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