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Direct interferometric measurement of coherence properties of high-harmonics from crystals[1] JIAN LU, ERIC CUNNINGHAM, YONGSING YOU, DAVID REIS, SHAMBHU GHIMIRE, SLAC - Natl Accelerator Lab — High-order harmonic generation in solids has emerged as a promising route to generate attosecond pulses and to probe electronic structure of bulk materials. The underlying dynamics are being debated in the form of relative role of inter- and intra-band electron dynamics. While the high density of solid-state media presents the potential for high efficiency, it also involves strong propagation effects to the driving laser pulse. As a result, the spatiotemporal properties of high-harmonics could be altered in a non-trivial manner. Here, we employ a robust homodyne spectroscopic method and measure coherence properties of extreme-ultraviolet high-harmonics from bulk MgO crystals. We record phase-stable interferograms of high-harmonics with good visibility, when two sources are identical. We watch how fringes move as we change the relative intensities. We perform measurements in both reflection and transmission geometry such that we can quantify propagation effects. From the fringe shift, we retrieve intensity-dependent emission phase of individual harmonics, consistent to the inter-band model. Our results provide solid foundation for attosecond pulse metrology based on a novel high-harmonic generation technique.

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