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Extracting the wave-packet phase in High-order Harmonic Generation with a homodyne interferometer. GEORGIOS KOLLIOPOULOS, JAN TROSS, CARLOS TRALLERO-HERRERO, James R. Macdonald Laboratory, Department of Physics, Kansas State University, Manhattan, KS 66506 — A novel self-referencing XUV interferometer is used as a tool of extreme sensitivity to below attosecond stability. Using a liquid crystal phase modulator, two spatially distinct high-order harmonic sources are induced with control on their relative brightness. The radiations from these two sources interfere in the far field providing a highly versatile implement for EUV interferometry. With this tool, we investigate the dependence of the phase of high-order harmonics on the driving field intensity. Our results are compared with theoretical and experimental reports in the existing scientific literature. The error estimates are improved and help to draw a clear picture of the intensity dependent atomic dipole phase in the process of high-order harmonic generation, as expected from the three-step model. However, we observe differences from the strong field approximation: low-order harmonics with photon energies below or near the ionization potential show also a phase dependence on the driving field intensity and a study of HHG driven by pulses in intensity regimes, where saturation effects become important, shows a deviation from the model. This behavior is radically different from what was observed for higher order harmonics.

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