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Wave front controlled attosecond few-slit interferometry. WEI CAO, ZHEN YANG, HUIYAO XU, KANG MI, Huazhong University of Science and Technology — A novel wave front controlled all-optical interferometer with high temporal resolution is presented. An intense few-cycle laser pulse drives high order harmonics and launches a few equally separated attosecond bursts, which is equivalent to a few-slit time domain interferometer and gives rise to odd number of harmonics in frequency domain. When a weak signal pulse was synchronized with the driver, it perturbs the electron trajectories for harmonic generation and alters the accumulated phase on individual attosecond pulse. This effectively builds up a tilt in the wave front of the few attosecond slits in time domain, leading to a shift in the harmonic photon energy. A simple expression for the delay dependent energy shift is derived, from which the waveform of the perturbing field becomes directly accessible, offering an efficient optical oscilloscope for characterizing petahertz electromagnetic field. In addition, the separation of adjacent time domain attosecond slits can be retrieved with a temporal resolution of 60 attosecond, providing a sensitive probe to grasp the structural information of the complex driving targets.

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