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An ionizing time domain matter-wave interferometer NADINE DOERRE, PHILIPP HASLINGER, PHILIPP GEYER, JONAS RODEWALD, STEFAN NIMMRICHTER, University of Vienna, Vienna Center of Quantum Science and Technology, Austria, KLAUS HORNBERGER, University of Duisburg-Essen, Germany, MARKUS ARNDT, University of Vienna, Vienna Center of Quantum Science and Technology, Austria — We discuss an optical matter-wave interferometer for clusters and complex molecules that uses absorptive ionization gratings in combination with Talbot-Lau interferometry in the time domain. We show recent results and present the future perspectives of the experiment. In this setup, a particle cloud passes alongside a mirror that reflects three equally timed UV lasers pulses. Electrons are detached from the particles in the antinodes of the formed standing wave gratings via single photon absorption. The created ions are extracted and only neutral particles remain in the interferometer, thus absorptive light gratings for matter waves can be realized. In contrast to material grating setups, this experiment operates in a pulsed mode, which makes the longitudinal motion of the particles negligible. This new kind of interferometer is a universal tool which will on the one hand allow us to explore the wave nature of massive particles, potentially up to a million atomic mass units and more. In combination with deflectometry and spectroscopy on the other hand, it offers the possibility to determine molecular properties, such as polarizabilities, electric and magnetic moments, absorption and ionization cross sections with high precision.

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