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Relativistic ionization and rescattering MICHAEL KLAIBER, KAREN HATSAGORTSYAN, ROBERT FISCHER, MANFRED LEIN, MARIO VERSCHL, CHRISTOPH H. KEITEL, Max-Planck-Institute for Nuclear Physics, Saupfercheckweg 1, D-69117 Heidelberg — In the relativistic regime the magnetically induced drift of the ionized electron severely suppresses the probability of the electron revisiting the ionic core and, consequently, the yield of harmonic photons. We propose several methods to increase the efficiency of rescattering in the relativistic regime. In the weakly relativistic regime, we demonstrate that the relativistic drift of the electron can be efficiently harnessed to enhance the recollisions of electrons from molecular orbitals with mirror antisymmetry [1]. In the strong relativistic regime, we show how efficient recollisions are feasible by employing strong laser pulses which are specially tailored as attosecond pulse trains [2]. For experimental realization it is more advantageous to employ counter-propagating attosecond pulse trains. This way the energies of the revisiting electron at the atomic core can reach the MeV domain, thus rendering hard x-ray harmonics and nuclear reactions with single atoms feasible. Other recollision schemes proposed are based on two consecutive counter-propagating laser pulses [3] and magnetic field. References: [1] R. Fischer *et al.*, Phys. Rev. Lett. 97, 143901 (2006). [2] M. Klaiber, *et al.*, Phys. Rev. A, 74, 051803(R) (2006). [3] M. Verschl, and C. H. Keitel, J. Phys. B, in press.

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