High order harmonic generation with Mid-infrared laser pulse

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Abstracts: *As one of the most important physical processes of strong-field laser-matter interaction, laser-driven electron-ion recollision is the fundamental process during high-order harmonic generation (HHG). For a multicycle laser field, the recollision process repeats itself every half-cycle of the laser field. Thus, many electronic trajectories would interfere constructively and the well-resolved discrete harmonic peaks can be generated. As we known, the well-known three-step model of HHG predicts that the cutoff law obeys Ecutoff = Ip + 3.17Up (Ip is the ionization potential; Up∝I λ 2 is the ponderomotive energy), implying that the cutoff energy of HHG can be extended by increasing the driving wavelength. The rapid development in ultrafast laser technology has enabled the construction of high-power femtosecond optical parametric amplifiers, which can offer a carrier-envelope-phase (CEP) -stabilized few-cycle pulse at midinfrared wavelengths. With the longer wavelength mid-infrared laser pulse, it is easy for the pondermotive energy of the returning electron to be very large. Only a few recollisions occur in a multicycle 1800/900 nm OTC laser field. KeV harmonics/fluorescence can be generated.*

[1] Manipulating electron-ion recollision in a midinfrared laser field, PHYSICAL REVIEW A 92, 033417 (2015)

[2] Ultrafast excitation of inner-shell electron by laser-induced electron recollision, Phys. Rev. Lett. Accepted.