Generation of Intense Few Cycle Laser Pulses for Driving Attosecond High Harmonic Emission

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We will report the recent progress at SIOM, in the field of generation of intense ultrafast laser pulses, and high order harmonic generation from atoms and molecules.

The high gain amplification in a large aperture Ti:sapphire crystal was achieved by developing a new scheme of parasitic lasing suppression, the 800nm laser output with peak power of 0.89PW and pulse width of 29fs was obtained. The generation of carrier envelope phase (CEP) stabilized intense infrared laser pulses by means of differential frequency generation and optical parametric amplification was demonstrated. Pumped by an 800nm Ti:sapphire laser, the CEP stabilized pulses are tunable from 1.2μm to 2.4μm, with the maximum output energy 1.2mJ in a 40fs pulse with the 6.8mJ pump energy. New scheme for measuring the CEP of ultrafast laser pulses was proposed.

High order harmonic generation towards attosecond XUV pulse emission in a precisely shaped laser field, either with two color or single color double driving laser pulses were intensively investigated, both theoretically and experimentally.

We investigated the high harmonic generation from aligned CO_2 molecules and demonstrated experimentally that the modulation inversion of harmonic yield with respect to the molecular alignment can be manipulated by tuning the intensity of driving laser pulse.