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High energy OPA and few-cycle IR pulses

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Using the 100Hz line of the ALLS laboratory (Varennes, QC) we achieved 1.8μm central wavelength two-cycle pulses with an energy per pulse of more than 4mJ. High energy amplification of a white light OPA output and propagation through a noble gas filled 2m hollow core fiber were needed to obtained this high gain in output energy compared to what was previously achieved for ultrashort 1.8μm pulses.

We expect this beam to be an ideal seed for a high harmonic generation (HHG) table-top x-ray source since the scaling law for the cut-off of HHG is linear with the laser intensity and the second power of the laser wavelength ($E_{CO} \propto I\lambda^2$). Using ALLS HHG chamber seeded with 1.8μm pulses, soft x-rays of 500eV were already obtained using 30fs pulses with an energy per pulse of 7mJ while a cut-off of 160eV was obtained with 11fs (1.8 cycle) pulses with an energy per pulse of 0.35mJ.

This presentation will discuss the process behind the few-cycle IR pulses generation, its characteristics and its potential as a high cut-off, high flux, ultrafast, table-top soft x-ray source through HHG. Uses for such a x-rays source will also be discussed.

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