Objective

Intense few-cycle pulses are necessary for a variety of experiments in ultrafast nonlinear optics, including the generation of single attosecond pulses by high-order harmonic generation. We are developing a technique to generate intense few-cycle pulses based on self-phase modulation inside a hollow fiber with a pressure gradient.

We demonstrate the generation, characterization and stabilization of TW-class, 2-optical-cycle pulses using a pressure-gradient hollow fiber compression technique.

Achievement

- We have demonstrated the generation of 5 fs, 5 mJ pulses at a repetition rate of 1 kHz using a pressure-gradient hollow fiber compression technique.
- The spectra broadened by self phase modulation were stabilized using a beam-pointing lock system.
- The beam could be focused to a nearly diffraction-limited spot size with an intensity as high as $5 \times 10^{18}$ W/cm$^2$.

References