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Carrier-envelope phase drift of 1mJ, few-cycle pulse produced by hollow fiber CHRISTOPHER NAKAMURA, HIROKI MASHIKO, CHENGQUAN LI, ERIC MOON, HE WANG, JASON TACKETT, ZENGHU CHANG, Kansas State University Physics, J. R. MACDONALD LAB TEAM — We investigated carrier-envelope (CE) phase drift due to self-phase modulation through a Ne filled hollow fiber. The high energy seed pulses in our experiments were generated using a grating-based chirped pulse amplification laser system. The system produces 25 fs pulses with output energy of 2.5 mJ at 1 kHz. The CE phase of the amplifier is stabilized by feedback controlling the grating spacing. The output beam was focused into a hollow fiber with interaction length of $\sim$1 m. To accommodate the seed energy, large core diameter hollow fibers filled with Ne gas were used for spectral broadening. The measured output pulse duration is 5.6 fs with energy of 1.2 mJ after dispersion compensation by chirp mirrors. The CE phase stability was monitored by out-loop f-to-$2f$ interferometery after the fiber. The dependence of the CE phase drift of a few-cycle pulse on the stability of the input laser and the gas pressure was investigated as well. Furthermore, with seed pulse power locked, the CE phase of the pulse is controlled to a standard deviation of 370 mrad. The peak power of the CE phase stabilized pulses, 0.2 TW, is twice that previously generated. The significance of seed pulse energy stability for CE phase stabilization of few-cycle laser pulses is demonstrated.

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