TOWARD GENERATION OF HIGH POWER ULTRAFAST WHITE LIGHT LASER USING FEMTOSECOND TERAWATT LASER IN A GAS-FILLED HOLLOW-CORE FIBER

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In this work, we could experimentally achieved the generation of white-light laser pulses of few-cycle fs pulses using a neon-filled hollow-core fiber. The observed pulses reached 6-fs at at repetition rate of 1 kHz using 2.5 mJ of 31 fs femtosecond pulses. The pulse compressing achieved by the supercontinuum produced in static neon-filled hollow fibers while the dispersion compensation is achieved by five pairs of chirped mirrors. We showed that gas pressure can be used to continuously vary the bandwidth from 350 nm to 900 nm. Furthermore, the applied technique allows for a straightforward tuning of the pulse duration via the gas pressure whilst maintaining near-transform-limited pulses with constant output energy, thereby reducing the complications introduced by chirped pulses. Through measurements of the transmission through the fiber as a function of gas pressure, a high throughput exceeding 60% was achieved. Adaptive pulse compression is achieved by using the spectral phase obtained from a spectral phase interferometry for direct electric field reconstruction (SPIDER) measurement as feedback for a liquid crystal spatial light modulator (SLM). The spectral phase of these supercontinua is found to be extremely stable over several hours. This allowed us to demonstrate successful compression to pulses as short as 5.2 fs with controlled wide spectral bandwidth, which could be used to excite different states in complicated molecules at once.