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Liquid sheet assisted temporal reconstruction of chirped picosecond pulses using PM-FROG

The performance of three different target types—glass slide, polymer film, and liquid sheet—was evaluated for use in plasma mirror Frequency Resolved Optical Gating (PM-FROG) diagnostic of chirped near-infrared laser pulses in the 1–8 ps range. The measurements were conducted at the High Power Laser System (HPLS) of ELI-NP, employing both arms of the laser system in a pump-probe configuration. Each target enabled spectral phase retrieval via a non-iterative reconstruction algorithm, but notable differences were observed in mechanical stability and spectral fidelity. Among the tested configurations, the thin liquid sheet—produced by colliding two micrometer-scale liquid jets—exhibited superior performance, offering reduced phase distortion and enhanced reproducibility. Group delay dispersion introduced by an acousto-optic programmable dispersive filter was accurately recovered, with a root-mean-square phase error of 6.2%. These findings establish the liquid sheet as a high-fidelity, high-repetition-rate target for pulse characterization in high-intensity laser systems.

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