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Pre-pulse energy suppression for high-energy ultrashort pulses by liquid jet based plasma mirrors JUNGMOO HAH, KIRK LIBERTY, JOHN NEES, BIXUE HOU, KARL KRUSHELNICK, ALEXANDER THOMAS, Center for Ultrafast Optical Science, University of Michigan, Ann Arbor, Michigan 48109-2099 — Currently, the peak intensity that can be achieved in the laser focus, with intensities in excess of 10^{21} Wcm^{-2} creates pre-pulse problem. The most successful way to eliminate pre-pulse is to use plasma mirrors. Plasma mirror contrast enhancement at relativistic intensities has been demonstrated by using pulses in the high contrast plasma mirror (HCPM) with a solid target (anti-reflection coated optics). However, every single shot requires high-quality optical surfaces. Therefore, the plasma mirror must be replaced and aligned before each shot. To overcome the issue, a liquid-based concept is attempted, and experiments are performed on the high repetition rate (500 Hz) Lambda Cubed laser (duration 30 fs). A continuously flowing fluid jet can be used as an optically flat surface that regenerates itself in less than a millisecond, which makes it possible to use high repetition rate laser pulse systems.

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