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Adaptive Beam Smoothing with Plasma-Pinholes for Laser-Entrance-Hole Transmission Studies[1] MATTHIAS GEISSEL, LAWRENCE E. RUGGLES, IAN C. SMITH, JONATHN E. SHORES, C. SHANE SPEAS, JOHN L. PORTER, Sandia Natl Labs — The concept of Magnetized Liner Inertial Fusion (MagLIF) requires the deposition of laser energy into a fuel-filled cylinder that is exposed to a magnetic field. To improve process, it is essential to optimize transmission through the foil covered laser entrance hole (LEH), which involves minimizing laser-plasma-instabilities (LPI). Laser beam smoothing is the most common approach to minimize LPI. It typically involves a Random-Phase-Plate (RPP) and smoothing by spectral dispersion (SSD). This approach can still cause LPI issues due to intensity "hot-spots" on a ps-time scale, and it inconveniently fixes the usable spot size. Changing laser spot sizes requires multiple dedicated RPPs. To study ideal spot sizes on a MagLIF LEH, the RPP/SSD approach gets cost prohibitive. As alternative, we use sacrificial thin foils (500 nm or less) at the laser focus, which instantly turn into a plasma-pinhole, acting as spatial filter. The smoothed laser spot size grows linearly with distance from best focus. We present experimental data for smoothing performance and resulting LEH transmission.

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