Abstract Submitted
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>1 Hz Renewable Films for Plasma Mirrors for High Repetition Rate Petawatt Class Laser Systems[1] ANTHONY ZINGALE, JORDAN PURCELL, Ohio State University, PATRICK POOLE, Lawrence Livermore National Laboratory, GINEVRA COCHRAN, CHRISTOPHER WILLIS, DOUGLASS SCHUMACHER, Ohio State University — Improving the intensity contrast of >1 Hz, high power lasers presents a unique challenge. Recently, we demonstrated a device capable of creating renewable plasma mirrors for intensity contrast enhancement based on variable thickness liquid crystal films. Tuning the thickness of these freely suspended films between 10 and 300 nm allows minimization of the weak-field reflectivity, where the films act as a conventional anti-reflection coating. The maximum possible intensity contrast enhancement from a single film exceeds a factor of 350 (Poole et al., Scientific Reports 6, 32041 (2016)). Films were formed on demand and in-situ, eliminating the need to raster or replace optics between shots. Here we describe a prototype device that can accommodate petawatt laser systems operating above 1 Hz. The prototype has shown sustained film production at 3 Hz for 20 hours, yielding >200,000 plasma mirrors using <10 μL of the liquid crystal 8CB. We also discuss measurements of film surface quality to diagnose prolonged plasma mirror reflection performance.

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