



## A high repetition rate plasma mirror for improvement of the contrast of a high power laser.

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Laser-plasma interaction on solid target depends strongly on the contrast of the laser pulse and a high-contrast laser pulse is required to suppress the generation of preformed plasma on these targets. To provide these high contrast pulses, Plasma Mirror (PMs) are used as an ultrafast optical shutter, rapidly changing its optical properties from almost perfectly transmissive to highly reflective. As new laser-plasma experiments with high repetition rate (1-100 Hz) are becoming available, it is desirable to have PMs that can be operated at these repetition rates.

In this paper we present a PM which can operate at 10 Hz over more than 10 thousand shots which can improve the laser contrast in two orders of magnitude with stability. The experimental setup developed at the L2A2 laboratory, at the University of Santiago de Compostela is based on a rotating target to provide new material for each laser shot at the relevant repetition rate.

The plasma mirror was operated for a 30 mJ, 27 fs, 10 Hz and the target is a BK7 substrate with antireflection coating, mounted on a three motors device to control the motion of the target. achieved a contrast gain of more than two orders of magnitude in the region around 10 ps prior to the main pulse. The temporal width of pulse is preserved after the PM and the beam pointing stability (x axis: 5.2  $\mu\text{m}$  RMS, y axis: 7.2  $\mu\text{m}$  RMS) is preserved for more than 2500 consecutive shots.

This PM was designed and implemented for the ELI-ALPS and could be used to improve the temporal contrast with high stability and a large number of shots, this development could be key to increase the repetition rate of experiments with solid targets with control over the contrast of the pulse.

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### References

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