

Vulcan Laser System: Short and Long Pulse Improvements

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The Vulcan Laser System is a large scale Nd:Glass Facility devoted to laser-plasma interactions, capable of delivering up to 2.6 kJ in 1 synchronised beam lines serving two target areas. In combination with 6 long pulse beams (with controllable pulse shape and lengths from 200ps to 6ns) are up to 2 short pulse beams (100ps down to 500fs) using Chirped Pulse Amplification (CPA). For one of the target areas these beams can be operated in long pulse mode enabling an 8 beam long pulse configuration.

Over the years, the Vulcan Laser Facility has constantly been developed to enable new capabilities for the user community and as laser technology has evolved. This also includes better characterization of the laser pulse parameters, mainly through the improvement of the on-shot diagnostics. The characterization of the laser beams is crucial for monitoring the performance of the laser and to enable a better understanding of the interaction physics.

In this contribution we will present the current work to improve the long pulse capability with the addition of a second long pulse oscillator with a programmable arbitrary pulse shape control system and developments of the laser trigger system to reduce the long to short pulse jitter down to tens of ps. This second long pulse oscillator will allow different pulse shapes to be delivered on the 2 different beam groups.

The improved diagnostic system also identifies the presence of on-shot aberrations affecting the focal spot quality for the short pulses. We present here the investigation performed and the plans to mitigate the issue.