

The New Ultrashort OPCPA Petawatt Class Beamline for Vulcan Laser Facility

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After many years of operation of the Vulcan Petawatt Laser Facility, delivering high-quality support for the laser plasma community, an improvement is required to keep the facility at a world-leading level. To better understanding the laser plasma interaction at the petawatt level and increase the flexibility of the facility, a new laser beamline was proposed. The design specification for the new beamline are:

- Pulse length: < 30 fs
- Energy: ~ 30 J
- Repetition rate: 1 shot every 5 min.

The main aim is to allow betatron radiation probing of the plasma, but also it will make a possible new class of experiments, having the unique capability to two petawatt class pulses with different parameters.

There are different laser technology that can provide laser pulses within the requested parameters. Using the expertise in the Central Laser Facility, we decided to use the Optical Chirped Pulse Amplification (OPCPA) for the new beamline.

In this way, a short pulse length could be amplified due to the large bandwidth of the process. While this is not important for betatron radiation, it will open a new set of experiments to study the QED effect. In addition to the new beamline, the long pulse capability for the Petawatt target is planned to improve, increasing the available energy to the kJ scale.

In this contribution, we present the new beamline project in the Vulcan laser system and the start of the art of the work.