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New Vulcan PetaWatt beamline: Ultra-broadband, picosecond OPCPA FrontEnd

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In order to perform strong field physics experiments such as particle acceleration, laboratory astrophysics, high energy density physics, high-energy ultra-short pulses (PW peak power) are strongly required.
The generation of such pulses can be performed through the Optical Parametric Chirped Pulse Amplification (OPCPA) technique. OPCPA main advantages, respect to the CPA, are the high single-pass gain, lower thermal effects and the ability to support broader amplified spectrum. Those are crucial parameters to generate intense pulses in the PW-regime at high repetition rate (RR).
In this contribution, we present an auxiliary PW beamline to Vulcan system (CLF, RAL) fully based on OPCPA using LBO non-linear crystal, ensuring broadband phase-matching conditions. This new beamline, delivering 30J, sub-30fs pulses with high RR (shot/minute), will open up the potential for novel pump-probe experiments when operated with the existing PW and long pulse beamlines.
The first phase consisting of an ultra-broadband, ps OPCPA system centred at 870 nm is already operational; it will belong to the FrontEnd system consisting of four ps-stages and three ns-stages. Adopting the non-collinear phase-matching scheme, the bandwidth of amplified pulses was ~200nm, sub-10 fs transform limit pulses. The ps-OPCPA is designed to deliver mJ-level pulses with 100 Hz repetition rate.

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