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The Extreme Photonics Applications Centre: A New Facility for Ultrafast Science & Applications in the UK

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Abstract

The Extreme Photonics Applications Centre (EPAC) is a new state-of-the-art laser facility for ultrafast science and applications being built at the Central Laser Facility (CLF) in Oxfordshire, United Kingdom [1]. Construction of a purpose built building to house EPAC was completed in April 2022, a photograph of which is shown in Figure 1. The first laser to be built in the facility will be a petawatt laser delivering 30 J, 30 fs pulses at 10 Hz pulse rate, and will be located on the second floor of the EPAC building. The petawatt beam will be delivered into two independent radiologically-shielded experimental areas (EAs), located on the ground floor of the EPAC building, to study applications of laser-driven secondary sources in industry, medicine, and security.

Fig. 1 Extreme Photonics Applications Centre building at the CLF, UK.

The petawatt laser design is based on an all-OPCPA frontend whose broadband output is amplified in a single-stage high energy Ti:Sa amplifier. The Ti:Sa amplifier is based on the helium gas-cooled multi-slab architecture developed for the CLF family of DiPOLE high energy, high pulse rate lasers [2]. The amplifier will be pumped by the frequency-doubled output of a DiPOLE100 diode pumped cryogenic gas cooled Yb:YAG slab laser delivering 120 J pulses at 10 Hz and 1030 nm. After amplification the beam will be expanded before the broadband pulses are compressed in a 4-grating compressor. The compressed pulses will then be propagated under vacuum down to the two EAs where secondary sources will be generated.

In this seminar, I will provide an overview of the EPAC facility and laser design, and provide a progress update on development and system installation in the EPAC building.

References

[1] Extreme Photonics Applications Centre https://www.clf.stfc.ac.uk/Pages/EPAC-introduction-page.aspx.

[2] P. D. Mason *et al*, "Development of a 100 J, 10 Hz laser for compression experiments at the High Energy Density instrument at the European XFEL," High Power Laser Science and Engineering, **6**, e65 (2018).