EPAC takes shape on the RAL Campus

Exciting progress has been made during the year on construction of the CLF's pioneering Extreme Photonics Applications Centre (EPAC).

Despite the on-going restrictions and work controls arising from the Coronavirus pandemic, construction work proceeded at pace. During 2020 a clear outline of the whole building envelope became visible. Some 7,500 m^3 of concrete was poured as the new building rose from the ground. The three experimental areas have two metre thick walls to provide appropriate shielding for the high energy experiments that will take place. A dedicated "test pour" and associated instrumentation gave confidence that cracking would not occur as the concrete mix dried out.

On the design side, work continued to finalise the internal building design ready for fit-out and commissioning, and to progress designs for the installed equipment. Despite the difficulties of remote working, good progress was made, and the essential tasks remained on schedule.

Professor John Collier, Director of STFC's Central Laser Facility, said:

"EPAC will drive the development and application of a completely new class of compact accelerators and advanced sources of radiation based on lasers. We expect this to lead to a step change in a number of fields, for example the rapid, 3D imaging of complex or moving structures, or systems under load like engines or turbines.

We've reached a very significant milestone for EPAC. I am delighted that this has been achieved on schedule whilst adhering to the necessary coronavirus controls, such as social distancing. This is a great credit to Mace, our construction partners, and the very effective collaboration with CLF staff."

EPAC is a new state-of-the-art high repetition rate laser-driven imaging facility that is being funded by the UK government through UKRI and partially the Ministry of Defence. Designed and hosted by the CLF on the STFC Rutherford Appleton Laboratory site, EPAC will provide a step-change in capabilities for laser-driven accelerator research in the UK, enabling cutting-edge experiments in plasma physics, laboratory astrophysics and condensed matter and material science. The unique capabilities of EPAC – combining near-light speed particles and synchronised ultra-intense electromagnetic fields – will provide a world-leading platform capable of generating extreme states of matter and the tools to probe, control and manipulate them, enabling exploration of some fundamental questions in nature including those in quantum electrodynamics. EPAC will image objects ranging from a piece of bone to complex working structures, like an engine in 3D at ultra-high contrast. These images will allow industrial and scientific users to explore and better understand both material properties and product performance at previously unreachable levels of detail, leading to better materials and products for end consumers. The facility will be open to users by 2026.

From this in April 2020…

To this in April 2021

Low carbon concrete has been used, comprising 75% Ground Granulated Blast Furnace Slag (GGBS) instead of traditional Portland Cement. This has reduced the carbon footprint by 48%, saving 1,373 tonnes compared to normal practice.