

Smaller, affordable particle accelerators for security



Hartree Centre
Science & Technology Facilities Council



Tech-X Corporation has accessed the high performance computing (HPC) facilities at the STFC Hartree Centre to accurately simulate particle beams of a novel next generation accelerator prototype.

Challenge

Particle accelerators can be used in many industries as a source of controlled X-rays for applications such as medical imaging and security scanners. Current cost, weight and space requirements are barriers to wider industry adoption of these existing technologies. Novel, smaller accelerator technologies have the potential to revolutionise areas such as cancer treatment and national security, so finding a way to make existing technologies smaller is a high priority. These novel acceleration techniques currently fall short of conventional ones in the creation of particle beams with appropriate characteristics. If scientists could address this issue, it would enable the creation of novel accelerators that do the same job as conventional ones but in a smaller space.

The ability to rapidly prototype experimental designs for these novel accelerator technologies relies heavily on accurate accelerator beams simulations, which cannot be achieved without international class, high-resolution computation such as that of the Hartree Centre.

Solution

Tech-X have a base at the Sci-Tech Daresbury campus alongside the Hartree Centre and STFC's Accelerator Science and Technology Centre (ASTeC). Specialising in the simulation of plasma and electromagnetic phenomena on leadership-class computers, Tech-X have combined their beam modelling expertise with the Hartree Centre's compute intensive capability to help university researchers reduce the use of approximations in their beam models. This increases the accuracy of the models to help design higher quality beams.

Benefits

This project could eventually facilitate the development of next-generation 'table-top' accelerators. For businesses in the medical and security industries, this would add value by breaking down the size and cost barriers of accelerator-based R&D. Companies that might have previously considered these barriers too high could then develop smaller and more cost effective products. More versatile accelerator technology will also provide social and economic benefits by enabling the development of more convenient and portable medical imaging capabilities to provide cheaper treatments with better outcomes. There is also the potential to develop more efficient security scanners to increase safety and reduce processing times for users of airports, international train stations and other high security establishments.

Work with us

We collaborate with industrial clients and research partners on projects that create insights and value using high performance computing, big data analytics, simulation and modelling.

By combining our world-class facilities with access to our specialists and computational scientists, we can enable your organisation to produce better outcomes, products and services more quickly and cost-effectively than through conventional R&D workflows.

With our partners we are developing the next generation of supercomputing architectures and software, combining existing best practice with innovation to deliver faster, cooler and more sustainable solutions capable of meeting the challenges of data intensive computing.

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