Science & Technology Facilities Council

Accelerator Science and Technology Centre

The Accelerator Science and Technology Centre (ASTeC) is a centre of excellence, within the Science and Technology Facilities Council.

ASTeC has wide ranging expertise in the science and technology of particle accelerators, covering large scale international and national research facilities through to specialised industrial and medical applications. In addition, ASTeC runs a programme of world class research and development studies to enable the solutions needed for the next generation of particle accelerators.

ASTeC's innovative designs enable research capabilities that will lead to advances in a wide range of science and engineering that could greatly improve the quality of all our lives. A vision for the future that really could change our world.

Charged particle accelerators are at the heart of numerous frontier projects in science and technology, including large scale international research facilities for particle physics and major UK centres such as proton and electron synchrotrons for generating either neutrons or photons. Alternative, smaller solutions are applied to medical and industrial applications. The technologies associated with all modern particle accelerators continue to evolve and demand associated R & D programmes to be pursued.

Staff from ASTeC have expertise in all aspects of particle accelerators, from design through construction to commissioning. In addition to specific accelerator projects, we are engaged in an ongoing programme of world class research and development studies.

ASTeC staff are based at both the Daresbury and Rutherford Appleton Laboratories.

Modelling the behaviour of charged particle beams in accelerators and transport systems is fundamental and underpins all of ASTeC's activities. The designs developed for electron accelerators are generally aimed at creating intense sources of light for carrying out cutting edge scientific research. The most advanced of all light sources is called the free electron laser which is capable of generating ultra-intense sources of light in the X-ray region of the spectrum – the most interesting region for researchers. ASTeC has recently designed and commissioned a free electron laser - the first of its

kind in the UK – which will enable scientists to study chemical reactions as they happen and to understand biological processes such as the behaviour of a drug within the body.

ASTeC has the capability to not only design advanced electron accelerators and free electron lasers but also the skills needed to exploit the intense light produced. The light is so intense that very careful design of mirrors and lenses is required to focus it at the experimental sample without damaging the precise optics required.

ASTeC also models highly intense proton and ion beam accelerators which can be applied to a wide variety of applications such as neutron production for basic science research, particle beam therapies for cancer treatment, and potentially also as energy generation facilities. In addition muon accelerator systems are studied in connection with neutrino production concepts.

The key technologies that underpin all modern particle accelerators are studied and developed within ASTeC. These include:

• Magnets of all types (DC, AC, and pulsed) and all technologies (permanent, normal conducting, and superconducting). We also have an advanced magnet measurement laboratory that we use to validate our designs.

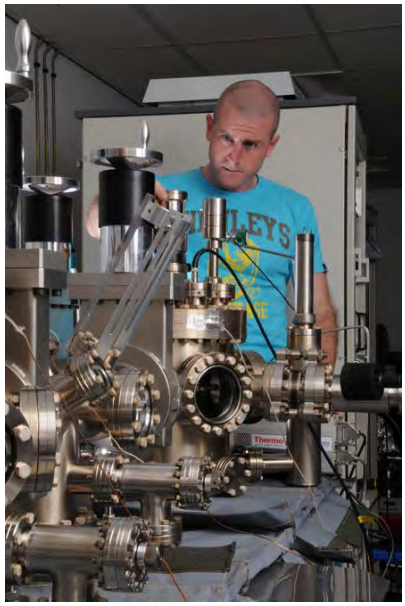
• Radiofrequency systems used to supply the acceleration to the charged particles. Our expertise covers RF structures and power sources, ranging from low level controls to very high power solutions. We have expertise in both conventional and superconducting systems.

• Vacuum science and surface science expertise combined with knowledge of the latest vacuum component technologies are used for the complete design of large and complex vacuum systems as required by all advanced particle accelerators.

• Diagnostics and advanced instrumentation to understand and optimise the behaviour of the charged particles within the accelerator system. We are able to measure the charged particles in both space and time with incredible accuracy and continue to develop new techniques which will enhance the performance of future accelerators.

ASTeC is a partner in the Cockcroft Institute, together with the universities of Lancaster, Liverpool and Manchester. We also have strong collaborative links with the John Adams Institute, many other UK universities and with most of the world's major accelerator laboratories.

On announcing the enterprise zones David Cameron confirmed £2.5 million investment in a unique specialist environment required for the development and testing of the next generation accelerator technologies, that have the potential to revolutionise health, medicine, security and energy.



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