

**Particle and Accelerator Physics Masterclass**

Located in Cheshire on the Sci-Tech Daresbury campus, the STFC [Daresbury Laboratory](http://www.stfc.ac.uk/1903) is a world-renowned centre of excellence specialising in particle accelerator technology.  The laboratory has many international collaborations which include close links with [CERN](http://public.web.cern.ch/public/en/About/About-en.html), and works to exploit and push the cutting edge of particle accelerator technology.  This technology underpins research in particle physics, and enables the construction of accelerator-based light sources which are the research tool for many other scientific fields such as condensed matter and semiconductor physics, chemistry and catalysis, materials science, protein crystallography and drug development.

The [Cockcroft Institute](http://www.cockcroft.ac.uk/) at Daresbury Laboratory is an international centre for accelerator R&D, and it will host the Laboratory’s next annual [Particle Physics Masterclass](http://www.particlephysics.ac.uk/teach/master-classes.html) days between February 28th and March 2nd, 2017.  It is a fabulous opportunity for year 12 and 13 students with an interest in physics to get a real insight into the technologies which underpin 21st century particle accelerators, and to see how these machines are used to push the boundaries of scientific technique and knowledge.  Staff from the Institute will lead this masterclass which combines lectures, demonstrations and hands-on practical sessions. The aim is to give an overview of basic accelerator technology and how this has been used to deliver the [ALICE](http://www.stfc.ac.uk/ASTeC/Alice/36001.aspx) accelerator (Accelerators and Lasers in Combined Experiments) which drives the UK’s first [free-electron laser](http://en.wikipedia.org/wiki/Free-electron_laser) (FEL) – a state-of-the-art *tuneable* laser light source.

The masterclass programme will include:

* A history of the Daresbury Laboratory and the accelerator facilities it has hosted, augmented by a 3D visualisation of the ALICE FEL accelerator facility, and a tour of the actual machine
* A ‘*brief history of particle physics*’ lecture delivered by the University of Manchester
* An accelerator optimisation exercise to maximise particle beam collision rates in the LHC
* A data analysis exercise to extract particle signatures from real LHC collision data
* Demonstrations of vacuum and superconductivity – both critical enabling technologies
in modern accelerators
* A Virtual Reality interactive tour of the VELA particle accelerator
* A quiz (with prizes) on the material covered during the class

The class runs from 09:30 until 16:00, and lunch with the Cockcroft Institute staff will be included – this is a great opportunity for students to talk to real physicists and engineers about what they do.  Prior to the class, we will send participating schools a classroom preparatory exercise supported by a PowerPoint presentation in which students can estimate the electron beam energy in the ALICE particle source (the ‘*Injector*’) using a few simple measurements.

For further information or booking, please email Wendy Cotterill, or call on 01925 603 408.

Note to teachers:

* The masterclass is **aimed primarily at sixth form students**, though ***high-achieving year 11*** students may also benefit
* Attendance is limited to a maximum of 80 students per day. These students are split into 4 groups for practical reasons, with a maximum of 20 students in each group