Press Notice

25 June 2006

KEY ACCELERATOR CONFERENCE COMES TO THE UK

Over 1,000 scientists from around the world meet in Edinburgh this week to discuss the latest advances in particle accelerators.

These advanced scientific research machines underpin many improvements in our quality of life, as well as helping reveal more about how the universe formed and how it functions.

The UK has invested over £1 billion in particle accelerators in the last 5 years and is one of the leading countries in the world in understanding how to design and use them.

Delegates at the 10th European Particle Accelerator conference will discuss how the world will only be able to build one of the latest linear collider machines to investigate the constituent parts of matter; how CERN's new large hadron collider, which is due to start operating in 2007, will unveil secrets of the big bang and possibly reveal the mysterious Higgs boson; how new cancer treatments are being developed using protons produced by particle accelerators; and about a revolutionary new approach to designing intense light sources which is being developed in the UK.

Conference organiser Dr Chris Prior, of the CCLRC Rutherford Appleton Laboratory, said, "The UK is a world leader in this vital field of science. Particle accelerators are a fundamental tool for modern research. They improve our quality of life by contributing to the development of new medicines and new materials. They help us understand what happened in the Big Bang and why the universe works the way it does. They benefit the economy, by forcing the pace of technology development and transferring skills and knowledge from universities to industry."

"I'm delighted that we're able to host this conference here in Edinburgh and show Europe, and the world, that this country is at the very cutting edge."

The conference is being held at Edinburgh International Conference Centre from 26 – 30 June.

For more information, contact Tony Buckley (tel. 01925 603272 (up to 23rd June and from 28th June), mob. 07799 767603 (24th – 27th June, at the conference centre), e-mail a.g.buckley@cclrc.ac.uk).

MORE…

Notes for editors

1. The Council for the Central Laboratory of the Research Councils (CCLRC) is one of the UK's eight research councils. It is one of Europe's largest multidisciplinary research organisations supporting scientists and engineers world-wide. It operates world-class large-scale research facilities, provides strategic advice to the government on their development and manages international research projects in support of a broad cross-section of the UK research community.

2. Key facts about (i) EPAC '06, (ii) background information on particle accelerators and (iii) details of UK investment in particle accelerators over the last five years are provided below.

(i) EPAC '06

General

The European Particle Accelerator Conference is organised by the European Physical Society Accelerator Group (Chair: Dr Chris Prior). This year it will be held at the Edinburgh International Conference Centre, 26 - 30 June 2006.
It is the largest gathering of accelerator scientists outside the USA. More than 1000 people will attend, 90% of which are from outside of the UK (31 countries).
This is the 10th conference. Held every two years, EPAC 2008 will take place in Genoa.

Key presentations

- ***The Global Design Initiative for an International Linear Collider***, Barry Barish (CALTECH, Pasadena, California).
- ***Before the Big Bang: An Outrageous New Perspective, and its Implications for Particle Physics,*** Roger Penrose (Mathematical Institute, Oxford).
- ***Developments in Proton and Light-ion Therapy***, Sandro Rossi (CNAO Foundation, Milan).
- ***ITER and International Scientific Collaboration***, Stefano Chiocchio (ITER, Garching).

Industrial exhibition

The exhibition includes stands from 43 organisations from seven countries. The exhibition space is completely full and a waiting list is now in operation.

Bursary programme

60 accelerator science students will be attending EPAC 06 as a result of bursaries provided by accelerator science institutes around the world an (increase in the number of bursaries available at EPAC 04).

More details are available at www.epac06.org.

(ii) Background information on particle accelerators

What is a particle accelerator?

A particle accelerator is a device that uses electric and magnetic fields to propel electrically charged particles to high speeds. The largest and most powerful particle accelerators, such as the Large Hadron Collider at CERN in Geneva, are used for experimental particle physics, helping to reveal the nature of matter at the subatomic level and reveal what went on fractions of a second after the Big Bang.

Others – synchrotron light sources and neutron sources – are used to investigate the structure of different types of materials, including biological materials. Everyday products such as washing powder, chocolate and iPods are better because of research done using these machines.

Particle accelerators can move the smallest particles at the fastest speeds (up to 99.99997% speed of light).

Everyday examples of particle accelerators include cathode ray tubes in televisions, microwave ovens, aerials and X-ray generators.

Examples of existing and new particle accelerator projects

UK

SRS	• World's first dedicated synchrotron light source, based at Daresbury Laboratory in Cheshire, England • Started operating in 1981 and will close in 2008 • Produces intense beams of light, from the infrared down to hard X-rays • Reveals the 3-D atomic and molecular structures of materials • Played a key part in helping a UK researcher win a share in the 1997 Nobel prize in chemistry for work on F1-ATPase, the energy enzyme
ISIS	• World's leading pulsed neutron and muon source based at the Rutherford Appleton Laboratory in Oxfordshire, England. • Started operating in 1984 • Produces intense beams of neutrons and muons • Reveals the 3-D position and motion of atoms in materials of all kinds • Played a key part in revealing the structure of new high temperature superconducting materials • ISIS second target station starts operating in 2008, doubling the available capacity for experiments
Diamond light source	• Starts operating in 2007, based at the Rutherford Appleton Laboratory in Oxfordshire, England. • Largest investment in UK science for more than 30

	years • Life, physical and environmental sciences • Academic research questions e.g. superconductivity, particle interactions, spintronics, structure of proteins and DNA • Everyday questions e.g. corrosion in cars and planes, pollution in the environment, developing new drugs, food production processes
ERLP Energy Recovery Linac Prototype	• Testing a completely new way of using particle accelerators to produce beams of light • Technology testbed to power 4GLS
4GLS Fourth Generation Light Source	• Planned new UK light source • Will power a suite of lasers as well as producing high power light beams in the same way as synchrotrons • Will allow research on extremely fast timescales, showing chemical bonds as they are made and broken
Cockcroft Institute (collaboration between universities of Lancaster, Liverpool and Manchester, CCLRC, PPARC and NWDA) John Adams Institute (collaboration between PPARC, University of Oxford and Royal Holloway University of London)	• The Institutes aim to provide the intellectual focus, educational infrastructure, and the essential scientific and technological facilities for Accelerator Science and Technology research and development in the UK • develop novel and advanced accelerator technologies for particle physics and other applications; • train a new generation of accelerator scientists and engineers; • disseminate knowledge about the benefits of accelerator technology to a wide community; • make a major contribution to the design, development and construction of high energy, high intensity Linear Colliders; • Make a major contribution to the design, development and construction of new high intensity neutrino sources, such as the Neutrino Factory.

International

LHC Large Hadron Collider	• Starts operating 2007 • LHC will probe deeper into the fabric of the Universe than ever before and may be able to find the Higgs boson
ILC International Linear Collider	• Billion dollar project proposal • A proposed new electron-positron collider. • It would allow physicists to explore energy regions

	beyond the reach of today's accelerators. At these energies, researchers anticipate significant discoveries that will lead to a radically new understanding of what the universe is made of and how it works. • In the ILC's design, two facing linear accelerators, each 20 kilometres long, hurl beams of electrons and positrons toward each other at nearly the speed of light. Each beam contains ten billion electrons or positrons compressed to a minuscule three-nanometre thickness. As the particles speed down the collider, superconducting accelerating cavities give them more and more energy. They meet in an intense crossfire of collisions. • Over 100 institutes and universities from more than a dozen countries are involved in the project
Neutrino Factory	• A proposed particle accelerator complex that will produce the most intense and focused beams of neutrinos ever achieved. • The beams are intense enough to produce high detection rates even on the opposite side of the Earth. • PPARC and CCLRC are supporting MICE (Muon Ionisation Cooling Experiment) to demonstrate the feasibility of muon beam cooling needed for a future Neutrino Factory.

(iii) Examples of recent UK particle accelerator investments

In the last five years, UK investments have included:

- Diamond synchrotron light source (£500 m) at CCLRC Rutherford Appleton Laboratory, Oxfordshire
- The ISIS Second Target station Project (£140 m) at CCLRC Rutherford Appleton Laboratory, Oxfordshire
- Cockcroft and John Adams particle accelerator research centres (£10 m) at CCLRC Daresbury Laboratory, Cheshire and Oxford University/Royal Holloway, University of London
- Energy Recovery Linac Project (£17 m) at CCLRC Daresbury Laboratory, Cheshire

The UK operates two accelerator facilities within the UK for academic and industrial research, the Daresbury synchrotron radiation source (£20 m/year) and the ISIS pulsed neutron and muon source (£25 m/year).

The UK contributes towards the funding of two main overseas facilities, CERN (£76 m/year) and the European Synchrotron Radiation Source (£6.5 m/year).