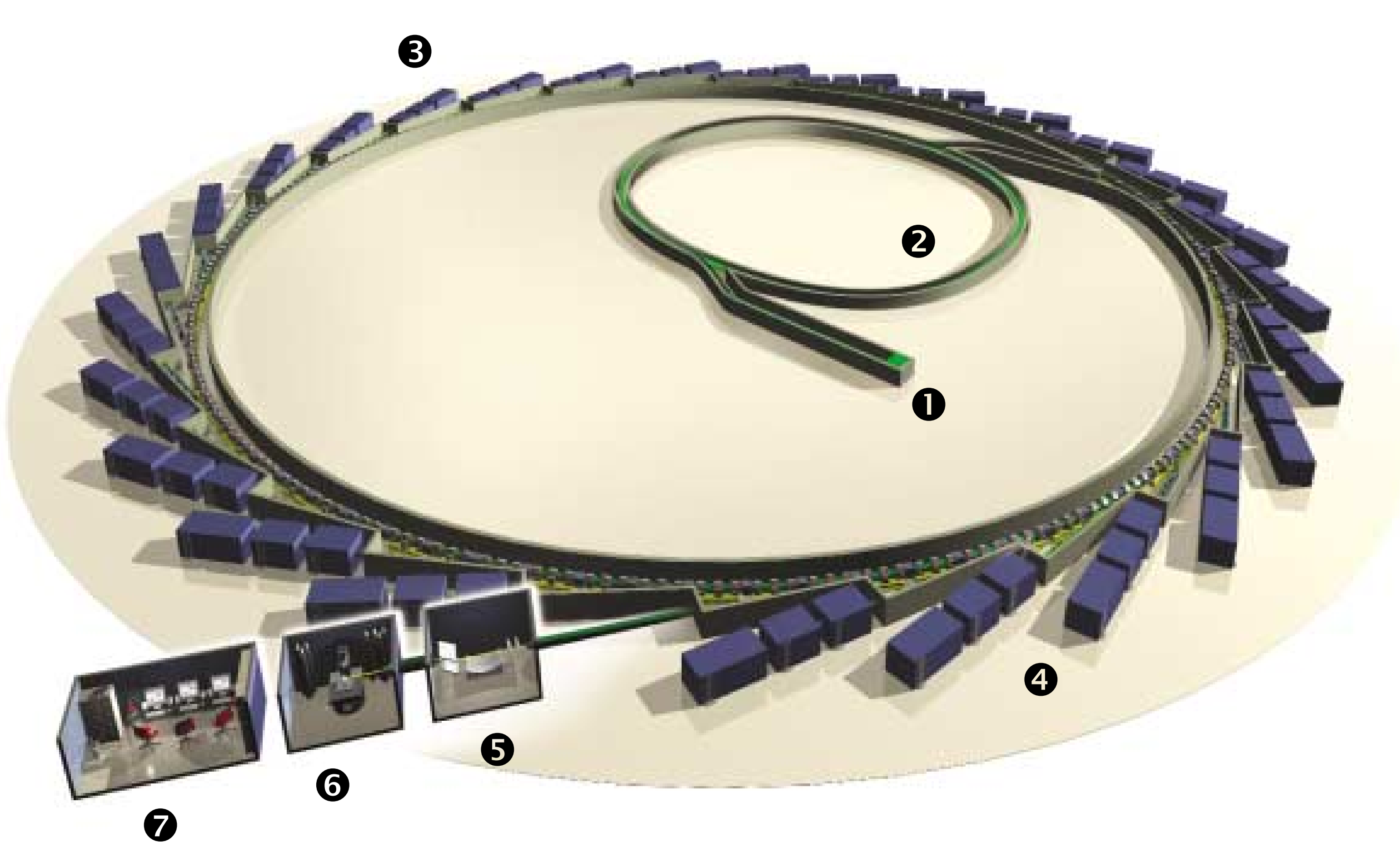
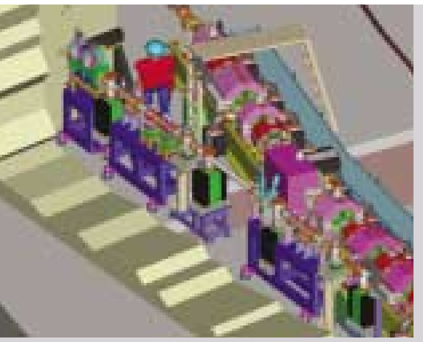




What is Diamond?

❶ Linac - Linear accelerator
❷ Booster synchrotron
❸ Storage ring
❹ Experimental station
❺ Optics hutch
❻ Experimental hutch
❼ Control cabin

❺ ❻ ❼ make up what we call the experimental stations or beamline

Diamond Light Source is a prestigious new synchrotron, currently being built and situated in South Oxfordshire on the Chilton/Harwell science campus. This new science facility could be described as a 'super microscope', housed in a striking doughnut-shaped building over half a kilometre in circumference, covering the size of 5 football pitches.

Diamond will ultimately host as many as 40 cutting edge research stations, supporting the life, physical and environmental sciences.

Many of the everyday commodities we take for granted, from chocolate to cosmetics, from revolutionary drugs to surgical tools, have been developed or improved using synchrotron light. This uniquely bright and intense light can reveal, treat and transform a vast range of materials. University researchers pursuing long-term fundamental research, are the core users of synchrotron light, but household companies through to high-tech start-ups have already benefited from the sort of data that will be generated by a facility such as Diamond.

Diamond Light Source Ltd is funded by the UK Government via the Council for the Central Laboratory of the Research Councils (CCLRC), and by the Wellcome Trust. This Joint Venture Company was established in March 2002 to build and operate the facility. Diamond Light Source will gather a team of 300 dedicated staff, including engineers, scientists, support staff and technicians from around the globe.

diamond

Light for Science

diamond

How to contact us:

Diamond Light Source Ltd
Chilton, Didcot
Oxfordshire
OX11 0QX
Tel: 0044 (0)1235 77 8130
Fax: 0044 (0)1235 44 6967
www.diamond.ac.uk

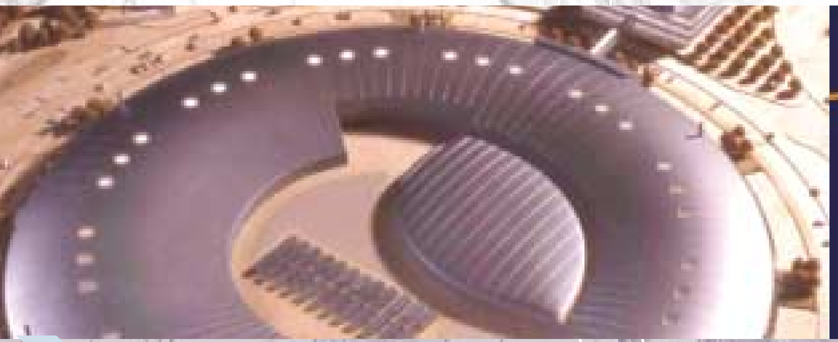
Printed Waterless Offset by Seacourt
Seacourt are registered to EMAS and ISO 14001

How will Diamond work?

At the heart of a synchrotron is its storage ring; a doughnut-shaped vacuum chamber through which electrons hurtle at nearly the speed of light. As these electrons circle through specially designed magnets positioned around the ring, they lose energy, which emerges as beams of very bright, highly-focused light of different wavelengths. It is this light that scientists use to drive their experiments.

Diamond will produce infra-red, ultra-violet and X-ray beams of exceptional quality and brightness, a thousand billion times brighter than from a hospital X-ray tube. These beams will enable scientists and engineers to delve deep into the basic structure of matter and materials, leading to scientific breakthroughs in the fields of biotechnology, medicine, environmental and materials science.

Diamond will be a third generation facility and a medium energy source, with an electron beam energy of 3 Giga electron Volts (3 thousand million volts). The specially designed magnet arrays, so called insertion devices will produce exceptionally bright light beams to suit a huge variety of complex experiments.

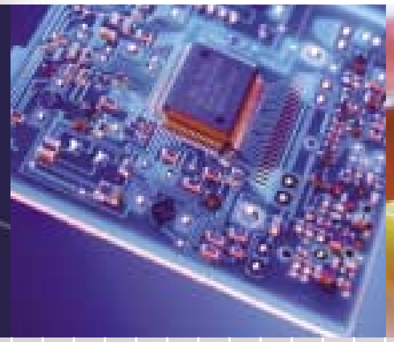


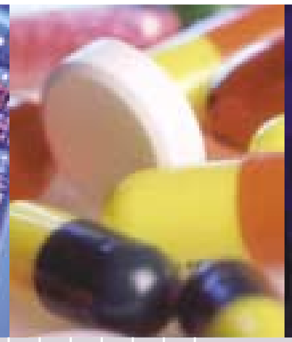
What kind of research will Diamond offer?

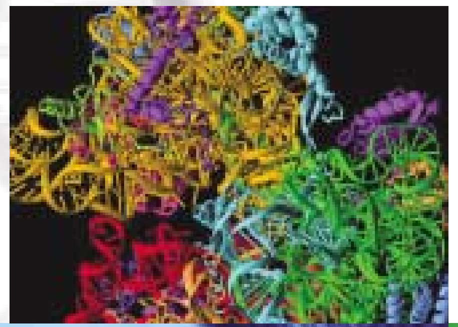
When Diamond opens in 2007, seven experimental stations, or beamlines, will come online:

- Extreme conditions beamline for studying materials under intense temperatures and pressures.
- Materials and magnetism beamline, set up to probe electronic and magnetic materials at the atomic level.
- Three macromolecular crystallography beamlines, for interpreting the structure of complex biological samples, such as proteins.
- Microfocus spectroscopy beamline, which is an X-ray microscope, able to map the chemical make up of complex materials, such as electronic components and geological samples.
- Nanoscience beamline, capable of imaging structures and devices at only a few millionths of a millimetre wide.

Diamond will steadily expand its capabilities with eventually some 40 research stations being available to scientists from both academia and industry. These stations will be designed to support the specific needs of the research community and make a significant step forward towards the development of state-of-the-art research methods.







What benefits will Diamond bring?

Biology & Medicine

Medical scientists are continually striving for a world free from disease. The race is permanently on to develop new drugs, so that both emerging and long-standing diseases can be prevented or eradicated. But how do scientists go about winning the race?

Solving the sequence of the human genome has been the first step towards developing medicines tailored to our individual genetic make-up. 'Rational' drug design is based on understanding the molecular basis of both the disease and the potential remedies. A vital piece in this complex jigsaw is slotted into place by a special technique called X-ray crystallography, using intense X-rays from synchrotron sources.

The fight against illnesses such as Parkinson's, Alzheimer's, osteoporosis and many cancers will benefit from the new research techniques available at Diamond. Investigating the structures of the proteins involved in these diseases, and others, will help scientists to understand them better, opening new avenues for treatment.

For example, the 'anti-Flu' drug Relenza, which was developed using structural information provided by synchrotron light, was a huge milestone in Australian biomedical science. It illustrates the exciting potential of rational drug design and the role that will increasingly be played by X-ray techniques.

Physical & Chemical Sciences

Without innovative, pioneering materials to choose from, UK industry would struggle to compete in the fast-moving world of product design. Often, understanding the structure of a new material is the key to perfecting the performance of the final product.

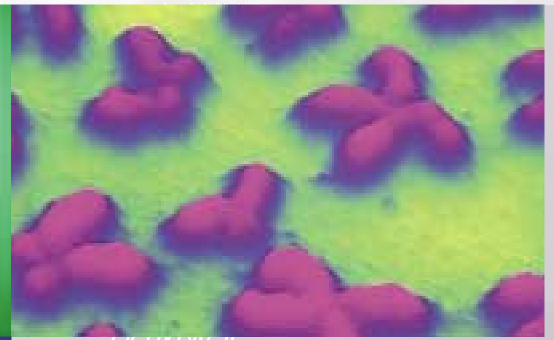
For electronic devices such as transistors, purity is crucial. The tiniest defect can ruin the quality of the entire component, leading to expensive waste during manufacture. Built up from layers of semi-conductor materials only a few atoms thick, transistors are notoriously difficult to visualise. Using a synchrotron source, engineers can image structures down to an atomic scale, helping them to understand the way impurities and defects behave and how they can be controlled.

Environment & Earth Sciences

Pollution is one of the major problems facing environmental science today. Understanding how contaminants make their way into the environment and how to counteract them can be a real challenge.

Some plants and micro-organisms have a natural ability to absorb toxic metals from contaminated land and deactivate them. Diamond will help researchers to understand how this happens and to identify organisms that target specific types of contaminants, opening up cheap and effective ways for cleaning up polluted land.

Already synchrotron light has helped scientists to understand the mechanisms and chemistry behind high levels of arsenic in Asian wetlands and pollutants in Pacific Ocean corals.



X-ray diffraction

extreme conditions

materials and magnetism

macromolecular crystallography

nanoscience

microfocus spectroscopy

Environment & Earth Sciences

Physical & Chemical Sciences

Biology & Medicine