

### 'Bright light'

The research facility at the CCLRC Daresbury Laboratory is centred around a huge circular machine - the Synchrotron Radiation Source (SRS). Synchrotron radiation is very bright light which includes infrared, ultraviolet and X-rays, as well as visible light.

Inside the SRS, a beam of electrons is accelerated to almost the speed of light. Sixteen huge magnets provide a field which bends the electrons into a circular path. As the electron beam accelerates through each of the magnets, each electron gives off synchrotron light, like a headlight, in front of itself. The light - a mix of many different forms - is collected and channelled along 'beam lines' to experimental areas, where teams of scientists use it for their research.

Emitting synchrotron light takes a great deal of energy. To replace the energy that the electron beam uses to create light, radio waves are fed into the SRS. The waves push the electron beam along, rather like pushing a playground roundabout to keep it turning. In this way, the same electron beam can give off synchrotron light for many hours.

Synchrotron light is as bright as the light from a million 100-watt light bulbs shining onto the area of a full stop. It allows scientists to perform experiments that would not be possible using a less bright light. Experiments that happen very quickly, or samples that are changing very rapidly, can be investigated easily because the light is bright enough to take a very brief 'snapshot' of the experiment. Synchrotron light is also different from ordinary light because it comes in pulses rather than being continuous. This means that data can be collected to reveal changes in a sample, rather like a video camera records many images of someone moving across the screen.

To make sure the electrons don't collide with air particles, most of the air is taken out of the SRS to create a vacuum.

The SRS operates 24 hours a day to provide intense beams of light for research teams who visit from all over the world. Their experiments help us to understand more about biology, chemistry, materials, physics and medicine.

### Useful websites

[www.srs.ac.uk/srs/](http://www.srs.ac.uk/srs/)

[www.cclrc.ac.uk/Activity/ACTIVITY=Brilliance](http://www.cclrc.ac.uk/Activity/ACTIVITY=Brilliance)