
ALBA
Light
to solve
challenges
of science

WELCOME TO THE ALBA SYNCHROTRON

ALBA is the only synchrotron light source in Spain and one of the most recent in Europe. Its operation, based on a complex of electron accelerators, lets you visualise and analyse matter and its properties at an atomic and molecular level.

Located in Cerdayola del Vallès (Barcelona), the ALBA Synchrotron generates about 6,000 hours of synchrotron light per year and operates 24 hours a day, 7 days a week.

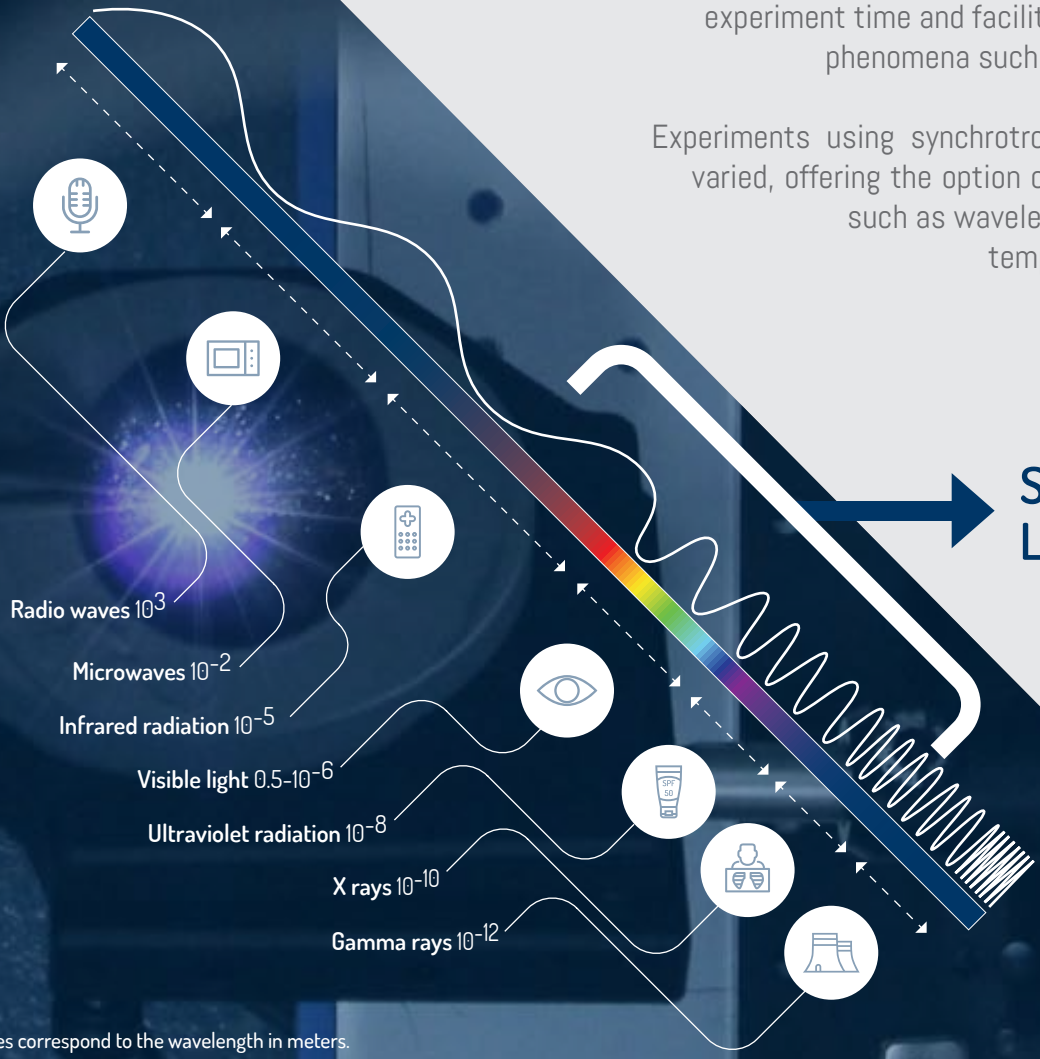
Managed by the public Consortium for the Construction, Equipment and Exploitation of the Synchrotron Light Laboratory (CELLS) and jointly financed by the Spanish and Catalan governments, the ALBA Synchrotron is a unique scientific and technical infrastructure (ICTS in Spanish) that brings added value to the scientific and industrial sectors.

WHAT IS SYNCHROTRON LIGHT?

Synchrotron light is electromagnetic radiation covering a continuum of wavelengths, ranging from infrared to hard X rays, including visible light. The main characteristic of synchrotron light is its extreme brightness (millions of times brighter than the surface of the Sun). This yields results with the most outstanding resolution. It also reduces experiment time and facilitates the study of rapid phenomena such as chemical reactions.

Experiments using synchrotron light are many and varied, offering the option of changing parameters such as wavelength, light polarization, temperature, pressure, etc.

ELECTROMAGNETIC SPECTRUM



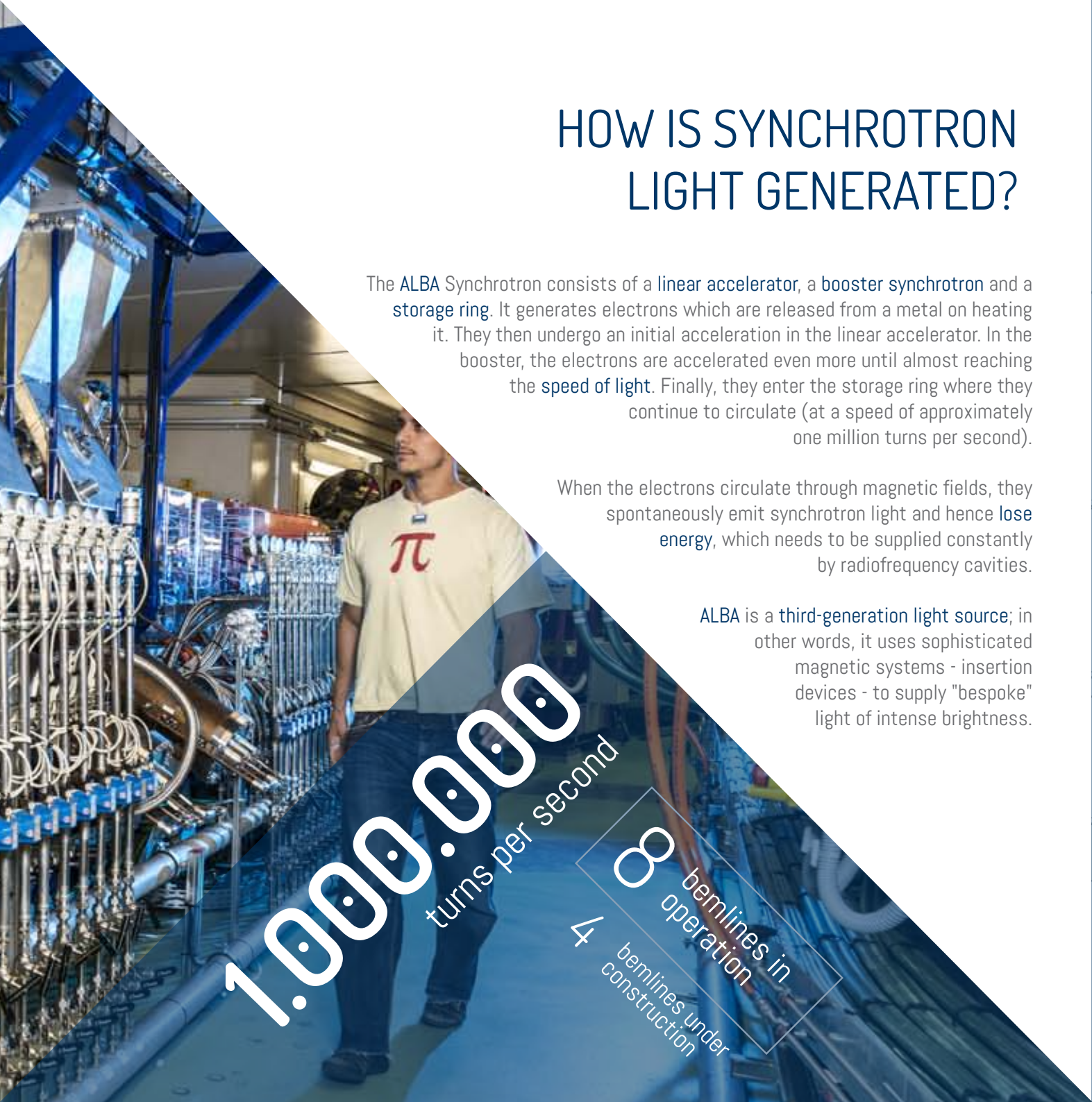
* Shown values correspond to the wavelength in meters.

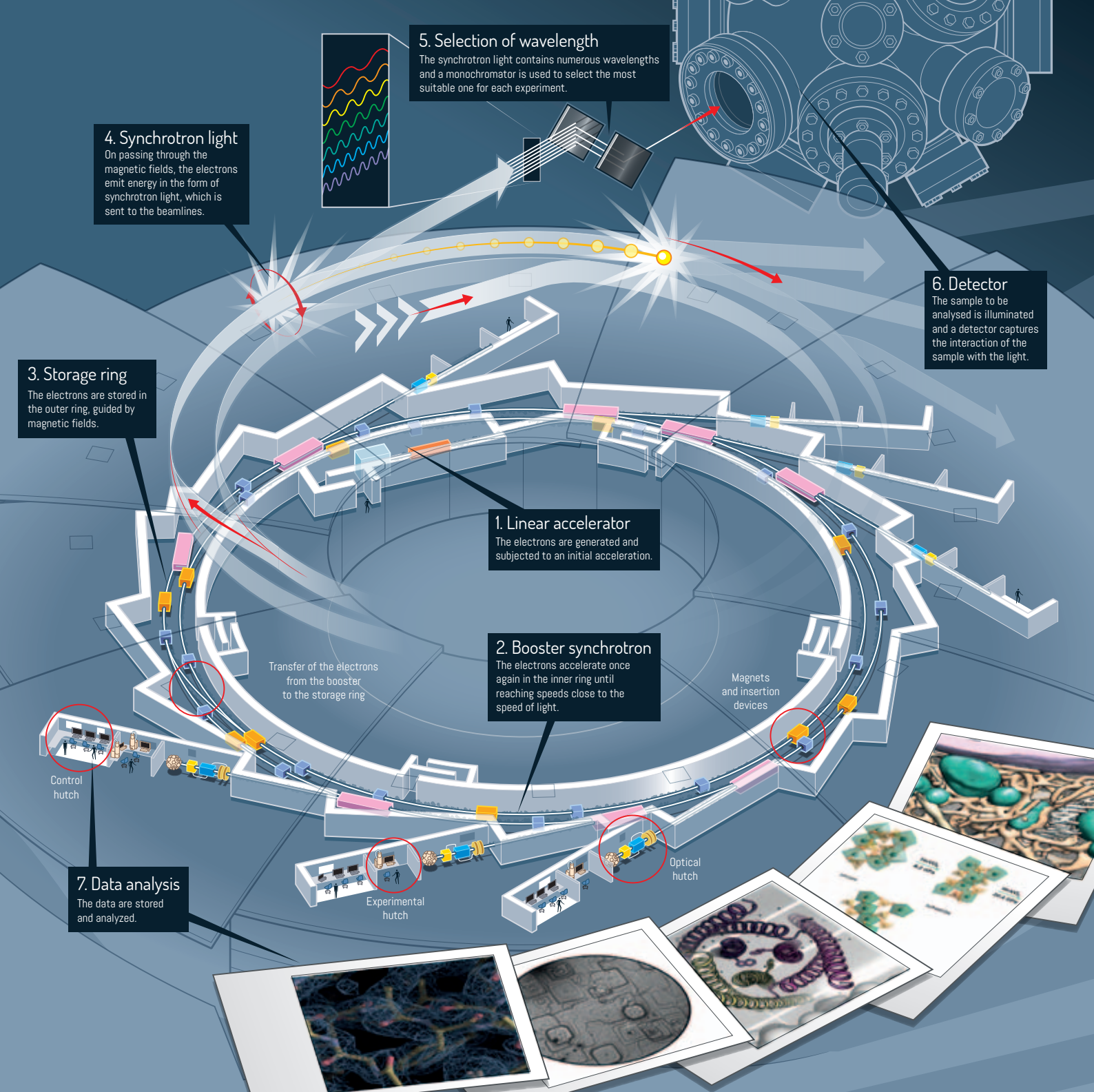
HOW IS SYNCHROTRON LIGHT GENERATED?

The ALBA Synchrotron consists of a linear accelerator, a booster synchrotron and a storage ring. It generates electrons which are released from a metal on heating it. They then undergo an initial acceleration in the linear accelerator. In the booster, the electrons are accelerated even more until almost reaching the speed of light. Finally, they enter the storage ring where they continue to circulate (at a speed of approximately one million turns per second).

When the electrons circulate through magnetic fields, they spontaneously emit synchrotron light and hence lose energy, which needs to be supplied constantly by radiofrequency cavities.

ALBA is a third-generation light source; in other words, it uses sophisticated magnetic systems - insertion devices - to supply "bespoke" light of intense brightness.




5. Selection of wavelength
The synchrotron light contains numerous wavelengths and a monochromator is used to select the most suitable one for each experiment.
4. Synchrotron light
On passing through the magnetic fields, the electrons emit energy in the form of synchrotron light, which is sent to the beamlines.
6. Detector
The sample to be analysed is illuminated and a detector captures the interaction of the sample with the light.
3. Storage ring
The electrons are stored in the outer ring, guided by magnetic fields.
1. Linear accelerator
The electrons are generated and subjected to an initial acceleration.
2. Booster synchrotron
The electrons accelerate once again in the inner ring until reaching speeds close to the speed of light.
Transfer of the electrons from the booster to the storage ring
Magnets and insertion devices
Control hutch
Experimental hutch
Optical hutch
7. Data analysis
The data are stored and analyzed.

USES

The properties of synchrotron light allow high quality information to be obtained on the characteristics of the samples under analysis. At present, ALBA has eight beamlines operating and four more under construction which are used for experiments in:

AN INFRASTRUCTURE AT THE SERVICE OF INNOVATION

ALBA receives more than 1,800 visits from research professionals:

Academic access

Twice a year, a call for experiments is convened; the top experiments are granted free synchrotron light time in exchange for publication of their research findings.

Industrial access

Industrial users can rely on the utmost confidentiality for their research, but the costs of experiments need to be covered. For further information, contact our Industrial Office.

www.albasynchrotron.es

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