Press Release
(October 12, 2006)

First experimental results obtained at SOLEIL

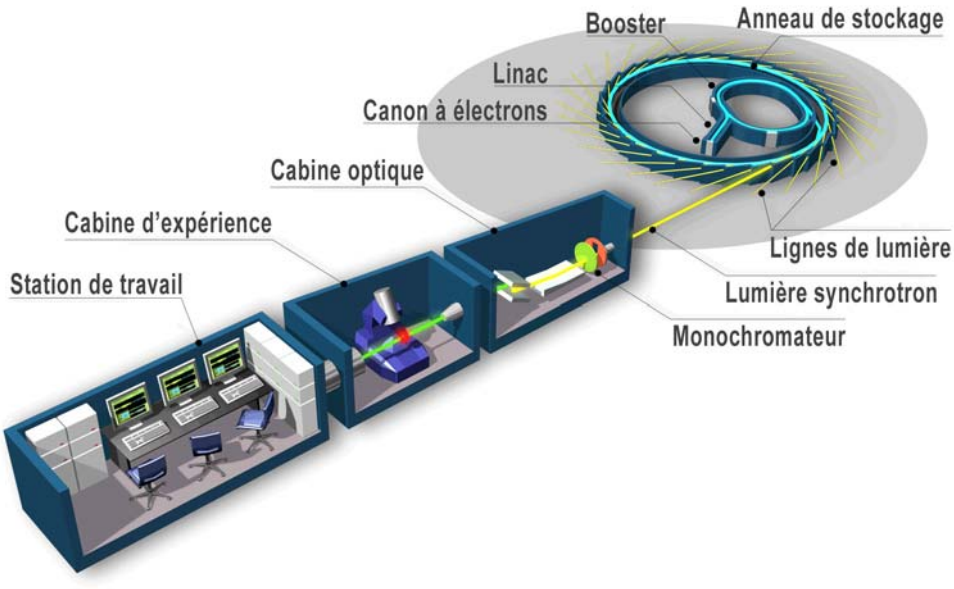
Less than a month after the opening of the first portion of DiffAbs, one of the 24 SOLEIL beamlines, the first experimental results were obtained from the synchrotron beam on October 11 by the beamline team.

The experiment, conducted on October 11, was an X-ray spectroscopy absorption experiment (EXAFS: Extended X-ray Absorption Fine Structure). A sample—here a piece of copper leaf 7 µm in thickness—was bombarded by high-energy photons from the optic cabin. The monochromator installed in this cabin permitted the selection of photons the length of the wave that had been chosen, from the white beam issuing from the storage ring. Thanks to photon detectors placed in front of and behind the sample, the quantity of photons absorbed by the copper could be accessed. A series of measurements was carried out while varying the length of the wave, and thus the energy, of the incident photons; this is an energy scan (in this case, from 8,700 to 9,700 eV).
In this way we obtain an absorption spectrum, the true signature of the element being studied. The spectrum provided by DiffAbs (figure 1) shows a principal pick of around 8,980 eV, called the absorption threshold, which is characteristic of copper, followed by smaller picks that provide information about the distances between atoms in the sample being studied. It is a spectrum that corresponds exactly to what is expected from this reference sample, and also provides very good resolution of the different picks.

The DiffAbs team will continue its tests for now, which are intended to improve spectrum resolution even more, and the team is satisfied by these initial results. An essential stage has just been completed!

REMINDER
Located on the Saclay Plateau in Essonne, SOLEIL is the second 3rd-generation synchrotron constructed in France; the first, the Grenoble ESRF, is a European synchrotron. SOLEIL is a public company whose two shareholders are the CNRS and the CEA, and in which the Ile-de-France region and the General Council of Essonne are quite deeply invested. The construction of such a facility requires both large sites and highly precise mechanics. It involves the acceleration of packets of electrons so that they produce an exceptionally bright light ray that covers a very wide range of wavelengths, from infrared to X-rays, including ultraviolet light. The characteristics of this light (intensity, focus, stability, polarization, etc.) permit the observation of matter at the atomic level and makes experiments possible that were inconceivable before, in fundamental as well as applied and industrial research. At SOLEIL, there are various fields mobilized by science and industry today: biology, chemistry, material sciences, environment, physics, Earth sciences, and cultural heritage and archaeology. The criteria defined for SOLEIL (operating energy, number of wavers, large spectral range from infrared to X-ray, brilliance, continuous injection for stability of micron beam, etc.) place it at the highest level of international competition.

CONTACT
Communications Department: Isabelle Quinkal - 01 69 35 90 06 - isabelle.quinkal@synchrotron-soleil.fr
Website: www.synchrotron-soleil.fr
Contact: webcom@synchrotron-soleil.fr



1) Synchrotron principle schema, with "zoom" on a beamline

- LINAC (linear accelerator): particles are produced by an electron cannon and undergo the first acceleration
- Booster: second accelerator, oval this time, whose role is to increase the energy of the particles until it attains the value set by SOLEIL designers, 2.75 billion electron-Volts
- Storage ring: The electrons will spin here for several hours, producing the synchrotron beam at each of their turns. To do this, "curving magnets" change the naturally rectilinear trajectory of the electrons. Other magnets called quadrupoles focus the particle beam so that its diameter is as wide as one hair. Wavers permit the production of the synchrotron beam in the straight parts of the ring.
- Beamlines, arranged all around the ring, designate the ensemble of the equipment ensuring the processing and operation of the synchrotron beam. Each beamline is an independent laboratory. Though only eight are represented in order to simplify the schema, there will be 24 available between now and 2009 at SOLEIL, which was designed to contain up to 43. Each line is made up of 3 successive cabins: the optic cabin (with various instruments permitting processing of the "raw" light beam issued from the storage ring); the experiment cabin (where the device with the sample to be studied is located); and the work station (to process data).

2) Absorption spectrum of copper, obtained with DiffAbs on October 11. The viewing of a pre-threshold (detachment in the middle of the principal pick) attests to the very good resolution obtained.