ABOUT SYNCHROTRON

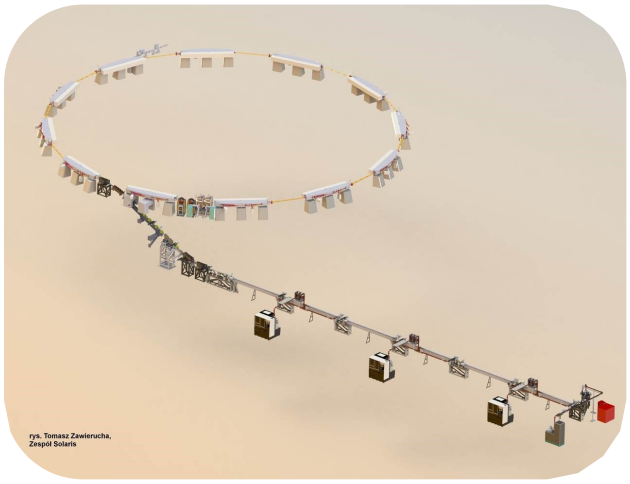
Synchrotron is an exceptional source of a unique light, which properties allow to look deep into the material and to perform precise analyses of this matter. It combines the function of the most precise microscope available and, in a way, of the scalpel. Thanks to synchrotrons it is possible to see both the composition of the analysed matter and its structure. Synchrotron light also stimulates the processes occurring within the matter.

Synchrotrons allow to make **breakthroughs** in disciplines such as biology, chemistry, physics, material engineering, medicine, pharmacology, geology or crystallography. They contribute towards the development of innovative industries. Thanks to synchrotrons it is possible to educate the research personnel at the world class level. Synchrotron also creates new possibilities in the field of science popularisation.

Those were the reasons why the Solaris synchrotron was recognised as a strategic investment and was included in **the Polish Road Map for Research Infrastructures.**

building floor area – around **8 000 m^2**
floor area of the hall housing the storage ring – around **3 000 m^2**
hall location – **3,2 m** below the ground level
location of the linear pre-accelerator tunnel – **7,7 m** below the ground level
length of the linear pre-accelerator – around **50 m**
circumference of the storage ring – **96 m**
synchrotron weight, together with linear pre-accelerators and modulators – around **150 tonnes**
energy of the synchrotron – **1,5 GeV**

The Solaris synchrotron is **an electron accelerator** generating electromagnetic radiation of frequency ranging from infrared to X-ray frequency. The source of the electron beam is **the electron gun.** The electron beam generated by



the gun is accelerated in the **linear pre-accelerator,** until it reaches the initial energy of around **550 MeV.** The beam is then transported and injected into the storage ring.

The storage ring is the heart of the Solaris synchrotron. It comprises of **12 integrated electromagnets.** The magnets are evenly spaced around the circumference of **the 96 meter ring.**

Their magnetic field changes the electrons trajectory and allows them to travel along the closed orbit. At each of the trajectory bends the electrons emit synchrotron radiation, that is photons, characterised by a broad scope of energy.

The brightness of the synchrotron radiation is millions time greater than the brightness of light generated on the surface of the Sun.

This unique radiation, modified by the particular elements of the experimental beam line, is finally directed to **the research stations.**

Unique properties of the radiation allow the scientists to conduct advanced research, which would not be possible using traditional laboratories. The synchrotron application is as broad as broad is the meaning of the word „matter".

SOLARIS – THE CALENDAR OF THE PROJECT

April 2010
signing of a financing agreement with the Ministry of Science and Higher Education

March 2011
signing of the agreement with a construction company

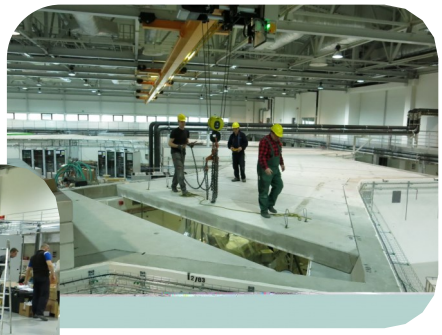
January 2012
start of the building construction

May 2014
acceptance of the building

June 2014
start of the machine installlation

November 2014
start of the linear pre-accelarator conditioning

April 2015
the storage ring installation finished



May 2015
start of the storage ring conditioning

19 June 2015
the first light at the exit to research stations

September 2015
installation of the first research line finished

21 September 2015
the opening ceremony of the National Synchrotron Radiation Centre SOLARIS

INTERNATIONAL COOPERATION

SOLARIS is the first synchrotron in Poland. Thus the project team wanted to cooperate with foreign synchrotron centres. This cooperation was mainly concentrated in all areas associated with the construction and commencement of the SOLARIS. The most important advantage of this cooperation was the access to the newest technological solutions and to the expert knowledge.

The following centres were among the SOLARIS partners:

- Elettra-Sincrotrone Trieste (Italy)
- Swiss Light Source (Switzerland)
- CELLS–ALBA Synchrotron (Spain)
- European Synchrotron Radiation Facility (France)
- Diamond Light Source (Great Britain).

From the very beginning, the most important partner of this project was **MAX IV Laboratory** from Sweden.

The Kraków synchrotron is a replica of one of two storage rings built in the Lund centre. Swedish scientists shared their innovative design and their expertise related to the construction of the synchrotron and the associated infrastructure. Specialists from Solaris spent many months in Lund, participating in MAX IV development in order to directly familiarise themselves with the synchrotrons and to discuss various aspects of constructing the scientific infrastructure, including associated power and water supply installations.

During the next stage of the project, the Swedish colleagues drew from the expertise of their partners from Kraków and learned about technological solutions, as Solaris earlier begun the installation of the synchrotron. Both teams, from Lund and from Kraków, spent endless hours discussing the research issues and problems associated with the project management.

MAX IV LABORATORY

Solaris is also involved in two other international initiatives:

The purpose of **the CERIC initiative** is to ensure access – through a specific barter exchange – to the world class research infrastructure in the Middle Europe Region. Thanks to this initiative, it will be possible to utilise this infrastructure to its fullest capacities.

CALIPSO-Wayforlight is an international consortium, which one of the main goals is to ensure the research teams access to European synchrotrons through reimbursing the costs of travel and accommodation associated with the conducted research. It also coordinates the development of the infrastructure of the synchrotron centres in the EU and the access to this infrastructure.

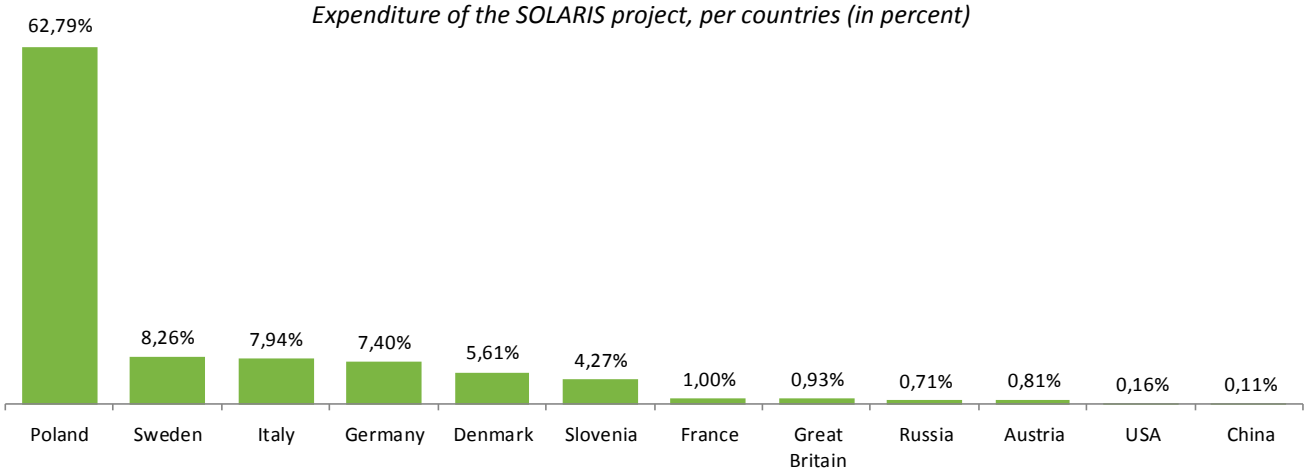
A large synchrotron in Lund.

PROJECT FINANCING

The total budget of the project entitled „National Centre for Electromagnetic Radiation for Research Purposes (Stage I)" is nearly **PLN 200 million.** The project is financed by the European Union from the European Regional Development Fund, as a part of the Innovative Economy Operational Program 2007–2013.

What is worth mentioning, the majority of expenses were allocated in such way, that they were spent in Poland, what was presented in the following graph.

Expenditure of the SOLARIS project, per countries (in percent)



FUTURE

The Solaris synchrotron **will be available to scientists** beginning **from 2016.** At the beginning, two beam lines with three experimental stations will be available.

Further plans include **installation of more than a dozen experimental beam lines.** Only then the Solaris potential will be fully utilised.

From the proposals arriving from around the country, the Scientific Advisory Committee selected for the National Centre for Synchrotron Radiation a portfolio of such beam lines. They represent various measuring techniques and allow to conduct research in various fields of science. Those proposals were developed as a result of the expectations of the Polish research community. Currently the search for finance sources for those investments in underway.

The extension of the linear pre-accelerator to the energy of 1,5 GeV is also planned. It will allow an uninterrupted work of the synchrotron for 24 hours 7 days a week.

SOLARIS also has potential for constructing in Kraków **a laser based on free electrons (FEL).**