LNLS

Computer representation of future LNLS installations: first third-generation source in Latin America

Sirius' partners

The Brazilian Synchrotron Light Laboratory involves innovative companies in the construction of its new light source

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The Brazilian Synchrotron Light Laboratory (LNLS) is inviting innovative Brazilian companies to help build Sirius, a new, third-generation synchrotron light source that will replace the current source, which has been in operation since 1997. The project will cost R$650 million, to be funded by the Ministry of Science, Technology and Innovation (MCTI) and other partners. On June 28, 2013, LNLS held a Sirius Partnerships workshop, in which it presented a list of the technological challenges involved in building the new source to about 50 company representatives. The estimate is that at least 70% of the project will be carried out with the assistance of partners. The workshop was a response to a 2009 suggestion by FAPESP, which gave the MCTI the idea of using the construction of Sirius as an opportunity to mobilize the research and development capacity of companies in the state of São Paulo.

Peter Wongtschowski, president of the Board of Directors of the Brazilian Center for Research in Energy and Materials (CNPEM), the organization responsible for managing the LNLS, said the initiative is an opportunity to strengthen Brazilian companies. "Importing will always be our second option. Our goal is to meet the demands of science and technology in Brazil and generate opportunities for domestic companies to invest in innovation." According to physicist Antonio José Roque da Silva, director of the LNLS, this type of partnership has differing impacts on businesses. "For a large company, the interaction is advantageous because it involves their teams in sophisticated challenges and qualifies them as suppliers in the accelerator market," says Silva. Two companies have already begun work: WEG, in Santa Catarina, is building the electromagnets, and Termomecanica, in São Bernardo do Campo, will provide copper pipes that require a different kind of lamination. Silva says that for start-ups, signing a significant contract is a challenge for a business that is still seeking to establish itself.

WEG's manufacture of electromagnets is a challenge, since they are not common production line products, says Antonio Cesar da Silva, the company's director of marketing and institutional relations. "We've always been driven by technological challenges. So much so that, in addition to an administrative board, we also have a science and technology board," he says.

According to Luis Carlos Rabello, Termomecanica board member, the chance to participate in the Sirius project will yield more than financial benefits: "The partnership will be productive for our company and for the country, which still lags behind in technological innovation."

SELECTION

The LNLS selected a set of challenges to be presented to companies (see box). They include, for example, "fluorescent monitors for electron beam profiles" and "development of low-power current sources," identified by mapping the set of systems and components needed for the ring. Some are expected to be delivered next year, while others only need to be ready later. In the case of the electromagnets from WEG, delivery will be staggered over time – more than a thousand parts need to be manufactured. Other components, such as the monitoring train, only need to be delivered when the tunnel is ready in 2016. In the coming weeks, the companies that show interest will be assessed based on their technical capacity. After the selection is made, the companies must keep to a tight schedule, which includes prototyping, testing and manufacturing. Some of the components will be produced abroad. "Some sophisticated systems require a long production process, such as the manufacture of mirrors. There would not be time to produce them in Brazil," said Silva.

Involving companies in the construction of large scientific facilities is common practice in Europe and the United States, but still rare in Brazil. The National Institute for Space Research (INPE) uses the competence of Brazilian aerospace technology companies in various projects. The construction of the dome for the SOAR telescope in the Chilean Andes, and the development of cosmic ray detectors for the Pierre Auger Observatory, in Argentina – projects supported by FAPESP – used domestic high-technology companies as suppliers (*see Pesquisa* FAPESP *Nº 188*). "The LNLS provides an opportunity for companies in the state of São Paulo to develop and train their personnel. They can submit projects for funding through FAPESP programs, such as the Innovative Research in Small Businesses Program (Pipe)," said Carlos Henrique de Brito Cruz, FAPESP Scientific director, who attended the workshop. "A country cannot be strong in science and research in academia unless it is also has companies that are strong in these areas," he stated. During construction of the first accelerator, from 1987 to 1997, there was little partnership with companies. "The first accelerator was built almost entirely in-house, in part because of the social environment at that time, such as high inflation, the difficulty in importing anything and financial uncertainties," said Silva.

Synchrotron radiation is generated by electrons produced in an accelerator, which circle in a large ring at nearly the speed of light and, when they pass by magnets, deflect due to the magnetic field. Photons are emitted, resulting in synchrotron light. The electromagnetic waves at the LNLS are used by researchers all over the country, at end stations or beamlines at different points around the ring, in studies of the atomic structure of materials such as polymers, rocks, and metals, in addition to proteins, molecules for drugs and cosmetics, or even three-dimensional images of fossils or even cells. Based on technical specifications Sirius will be the only third-generation device in Latin America. "The partnership with industry is crucial because it will give us this perspective of innovation and scientific and technological development in Brazil," said Luiz Antônio Elias, the executive secretary of the MCTI. ■

Technological challenges

The LNLS is seeking companies to develop the following equipment, devices and systems

AREA	PRODUCTS
Optics	Masks for beamlines
	RMonochrome beamline slits
Power Electronics	Low-power current sources
	High-power current sources
	Digital source-regulation modules
Ultra-high vacuum	All-metal vacuum valves
	Metal chambers for ultra-high vacuum conditions
	Chambers for optical elements in vacuum conditions
Automation/Robotics	Robots
	Gamma Shutter (equip. to block gamma rays)
	Photon Shutter (equip. to block photons)
	Sample holder for experiments
Data control and supervision	Connectivity equipment
	Universal Control Board (UCB)
Mechanics and heat transfer	Nitrogen supply source
	Helium supply source
Beam diagnosis electronics	RF Front End (assembly and testing of boards)
	FMC Digitizer (assembly and testing of boards)
	Digital Back End (assembly and testing of boards)
	Photon position detector electronics
Beam diagnosis mechanical equipment	mechanical equipment for electron position measurement
	Fluorescent monitors
Materials	Heating tape
Mechanical	Mixers for RF amplifiers
	Waveguide systems
	Racks
	Mounts
	Mount alignment sockets
	Hutch (for experiments)
Control and automation	Tunnel monitoring train
	Interlock exchanges
Electronics	Cables