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BUENAS PRÁCTICAS
Actuaciones Cofinanciadas

Construction of two new experimental light lines

Singular Scientific and Technical Infrastructure ALBA Synchrotron

Programa Operativo Plurirregional de España

Año 2022

Fondo Europeo de Desarrollo Regional

Construction of two new experimental light lines in the Singular Scientific and Technical Infrastructure ALBA Synchrotron

The ALBA Synchrotron is a complex of electron accelerators designed to produce synchrotron light to visualize the structure and properties of matter, especially at the nanometer scale. It is located in Cerdanyola del Vallès (Barcelona) in Parc de l'ALBA. It is a public consortium, co-financed in equal parts by the General State Administration and the Generalitat de Catalunya. Its construction began in 2006, it was inaugurated in 2010 and became operational with official users in mid-2012. The ALBA Synchrotron is included in the Map of Singular Scientific and Technical Infrastructures (ICTS) approved by the Council for Scientific, Technological and Innovation Policy, chaired by Minister Pedro Duque, on November 6, 2018.

ALBA is a third-generation synchrotron light source comparable to the last ones built in Europe. The accelerator complex is composed of a linear accelerator, which is used to accelerate electrons up to 100 MeV; a propulsive synchrotron, where electrons are accelerated up to 3 GeV; and a storage ring where synchrotron light is generated and emitted to the different experimental stations. ALBA currently has eight operational beamlines, mainly for biosciences, magnetism and materials science.

The purpose of the project has been the construction and commissioning of two new experimental beamlines of the ALBA synchrotron:

- Line BL06 XAIRA (Microfocus MX), with an overall project budget of 6,900,000 euros, of which FEDER contributes 3,450,000 euros. https://www.cells.es/en/beamlines/bl06-xaira

- Line BL16 NOTOS, with an overall budget of 3,294,370 euros, of which ERDF contributes 1,647,185 euros. https://www.cells.es/en/beamlines/bl16-notos

In both cases the ERDF co-financing comes from the funds allocated the General Secretariat for Research, from the Pluriregional Operational Program of Spain 2014-2020 for projects of construction, expansion, improvement, renovation, remodeling or replacement of Singular Scientific and Technical Infrastructures included in the current ICTS Map. This funding has been articulated through two collaboration agreements between the Ministry of Science and Innovation (MCIN) and the Consortium for the Construction, Equipment and Exploitation of the Synchrotron Light Laboratory (CELLS) signed on June 21, 2017 for the XAIRA line and on November 29, 2018 for the NOTOS line.

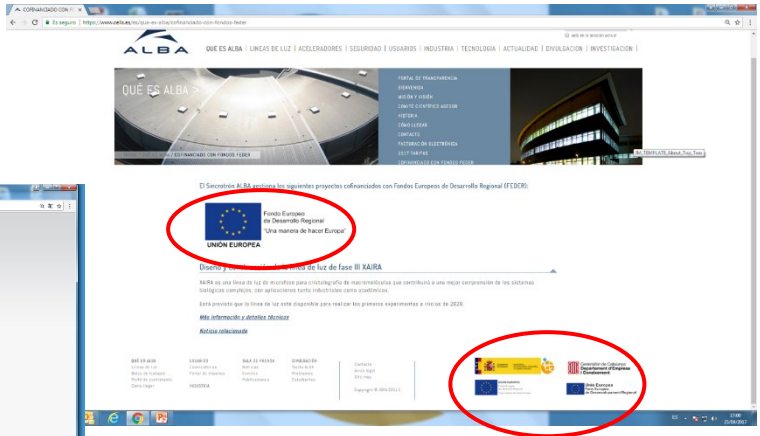
It is considered a good practice because it meets the criteria designed for this purpose:

1. High dissemination among beneficiaries and the general public. When the ICTS Map was approved by the Ministry of Science and Innovation (MCIN):

- organized a meeting with the directors of all the ICTS in which both the Deputy Director General and the Deputy Assistant Director General for Large Scientific-Technical Facilities of the MCIN informed of the existence of ERDF funds for the co-financing of ICTS

- published the book updating the Map of Singular Scientific and Technical Infrastructures (ICTS), in Spanish and English, with the ERDF logo and slogan on the front and back covers.

Sincrotrón ALBA includes on its web page images proving the aid received from the European Regional Development Fund:



Information on ERDF co-financing is included in all procurement documents.:

Núm. 128 Sábado 26 de mayo de 2018 Sec. V-A. Pág. 37067

V. Anuncios

A. Contratación del Sector Público

COMUNIDAD AUTÓNOMA DE CATALUÑA

29194 *Anuncio del Consorcio para la Construcción, Equipamiento y Explotación del Laboratorio de Luz Sincrotrón (en adelante, CELLS) por el cual se hace pública la formalización del contrato del suministro de dos (2) Front-Ends, para la línea experimental XAIRA-BL06 y para la línea experimental NOTOS-BL16 del Laboratorio de Luz Sincrotrón ALBA del CELLS.*

1. Entidad adjudicadora:
   a) Organismo: Cells.
   b) Dependencia que tramita el expediente: División de Administración - Sección Jurídica.
   c) Número de expediente: 44-17.
   d) Dirección de Internet del perfil del contratante: www.cells.es.
2. Objeto del contrato:
   a) Tipo: Suministro.
   b) Descripción: Suministro de dos (2) Front-Ends, para la línea experimental de microfoco para cristalografía macromolecular XAIRA-BL06 y para la línea experimental de absorción y difracción e innovación y desarrollo de instrumentación NOTOS-BL16, cofinanciado por el Fondo Europeo de Desarrollo Regional en el marco del Programa Programa Operativo Plurirregional de España (POPE) 2014-2020 (anteriormente licitado como Programa Operativo de Crecimiento inteligente 2014-2020)

Placas en el acceso a las instalaciones:

Likewise, in the annual reports of the center, since 2016, the information of ERDF co-financing in these lines of light is collected.

BEAMLINES IN CONSTRUCTION

Massimo Tallarida, Judith Juanhuix
ALBA Synchrotron

LOREA

In 2017 the insertion device has been installed inside the tunnel. The insertion device, an undulator with a period of 125 mm, will deliver the synchrotron light for LOREA in the energy range of 10-1000 eV with full polarization control.

Another important step for LOREA was the installation, also inside the tunnel, of the front end. Here the synchrotron light goes through acceptance slits before being delivered inside the experimental hall, to absorb the radiation that will not be used by the beamline.

The optical hutch, which will host the first mirror (M1) of the beamline, has been installed in the experimental hall. The intense radiation that will impinge on the M1 mirror will generate scattered and Compton radiation that has to be shielded with an optical hutch with highly absorbing metallic walls.

On the beamline side, the optical part has been definitively released with a change in the orientation of one focusing mirror (the vertical focusing mirror, VFM), now pointing down in order to decrease the final height of the beam at the sample position.

The main optical and mechanical parts of the beamline (the so-called "backbone") have been chosen, and are being purchased (in 2018). The monochromator, also part of the backbone, will be instead developed as an in-house project, and is proceeding within the schedule.

The end-station, the system where the experiment will take place, is on the way to be purchased, as well.

XAIRA

The construction of the future XAIRA microfocus beamline fulfills a long-standing request from the scientific community, and is currently one of the major investments at ALBA. XAIRA aims at providing a stable, high-flux X-ray beam with a micrometric size and a wavelength of around 1 Å (12 keV photon energy) to perform macromolecular crystallography (MX) experiments and resolve the structure of the macromolecules involved in any relevant biological function at near-atomic resolution. The scientific case of XAIRA focuses on projects in which the macromolecular crystals only grow in micrometric sizes, possess a reduced diffracting power or require complex data collection strategies.

The XAIRA beamline is also intended to cope with native phasing methods, which allow resolving the structures of macromolecules by exploiting the anomalous scattering of light elements, like S, naturally occurring in macromolecular crystals. To this aim, the beamline is also capable of reaching 3 Å photon wavelength (4 keV photon energy), for which the anomalous signal from micron-sized crystals is optimal.

The new beamline will complement the existing XALOC MX beamline, which was conceived to tackle a broader, general range of crystallographic cases. The XAIRA beamline instruments close to the storage ring are currently being manufactured. The beamline optics is designed and being specified for procurement and the design of the end-station and the sample environment has already started.

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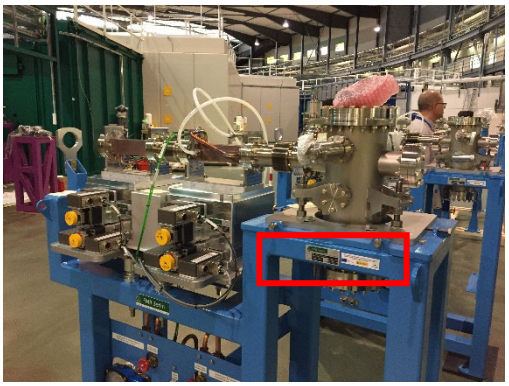
BL06-XAIRA is co-funded by the European Regional Development Fund (ERDF) within the Framework of the Smart Growth Operative Programme 2014-2020.

ALBA ACTIVITY REPORT 13

Also through social networks (Instagram and Twitter) the ALBA Synchrotron has spread the word about this ERDF co-financing.

All the equipment that makes up this beamline carries ERDF co-financing identification labels:



2. The project includes innovative elements

The design of the XAIRA line is unique in Europe because, from a technical point of view, the conception and construction of the beamline includes the design and production of specific solutions. It has the singularity of providing an X-ray beam on the sample of micrometer dimensions, which opens up enormous scientific possibilities not otherwise accessible, representing a very clear qualitative leap in the type of experiments that it is possible to address in the fields of structural biology and biomedicine and repositioning the ALBA synchrotron at a competitive level on a global scale.

The construction of the NOTOS line has involved a confluence with the instrumentation of BM25A, the Spanish line in the European Synchrotron Radiation Facility (ESRF). NOTOS is dedicated to absorption, diffraction and scientific instrumentation testing techniques.

3. Adequacy of the results obtained to the established objectives.

The objective of this project was the construction and commissioning of two new synchrotron light lines. It has been fully achieved as the construction of the two lines has been completed and they have already been put into operation. Even the NOTOS beamline received the first experiments from academic and expert users in May 2022. Both agreements end in June 2023

4. Contribution to the resolution of a problem or weakness detected in the territorial scope of execution

The conception and construction of these two new beamlines include the design and production of specific solutions related to this synchrotron that can be developed with regional and/or national companies, which contributes to boost its highly competitive economy. Thus, the companies involved benefit not only from the investments made, but also from the experience of participating in the development of such advanced technologies that provide them with added value in their future competitions with other companies in the sector. On the other hand, the incorporation of personnel necessary for the construction and operation of this new line has led to the creation of jobs with highly qualified scientific and technical profiles, thus contributing not only to the increase in employment, which is clearly necessary, but also to quality employment..

5. High degree of coverage of the target population

The construction of the two lines complements and expands the range of techniques and capabilities provided to the scientific community (academic and industrial). The new beamlines are considered to improve by more than 10% the annual hours of experimentation, increasing significantly the productivity of ALBA as a whole. The scientific justification supporting its construction, together with extensive information on the user groups that plan to use it and the conceptual description of its configuration can be found at the following addresses:

https://www.cells.es/es/beamlines/en/beamlines/phase-iii-beamlines-1/2014_10_1_microfocus-mx-bl-alba-phase-iii.pdf

https://www.cells.es/en/beamlines/phase-iii-beamlines-1/2014_10_2_notos-test-bl-alba-phase-iii.pdf

In addition, the construction of XAIRA has a special relevance for the biomedical area, so the results of the studies carried out with it are of obvious interest to the general public. By way of example, this technology will make it possible to obtain structural information on membrane proteins that will allow detailed study of drug-macromolecule (target) interactions at the atomic scale to understand the mechanisms of action, which will greatly facilitate the field of design and development of new drugs. Moreover, NOTOS aims to meet the specific needs of several scientific disciplines such as chemistry, catalysis, energy science, nanomaterials, condensed matter and environmental science for the study of electronic structure. As an example, it should be noted that its first use by CSIC users was to analyze different types of materials currently used in commercial batteries for electric vehicles.
Undoubtedly, the results obtained from the studies carried out with both beamlines will result in significant benefits for the scientific community in particular and for society as a whole.

6. Consideration of horizontal criteria of equal opportunity and non-discrimination, as well as social responsibility and environmental sustainability

Since its beginnings, ALBA synchrotron has been committed to the promotion of gender equality and has developed a series of actions aimed at promoting equality and non-discrimination, leading to transform the culture and good practices in its organization. All this is reflected in its first gender equality plan, which can be consulted at the following address:

file:///C:/Users/beatriz.albella/Downloads/I%20Plan%20temporal%20de%20igualdad%20de%20g%C3%A9nero.pdf

It is worth noting that the XAIRA line, as shown in the screenshot of the Instagram message they posted in June 2020, is painted with the colors blue-white-pink, the colors of the trans pride flag, to vindicate and make this group visible..

On the other hand, they have a strong commitment to the education of new generations, developing training activities and providing academic support. Its ambitious student program offers different types of training internships to acquire knowledge and skills in a wide variety of scientific and technological areas. This program benefits undergraduate and master's degree students, as well as Dual Vocational Training students. Other academic training sub-programs target postdoctoral and predoctoral researchers.

Since February 2019 the ALBA Synchrotron is part of the Network of Scientific Culture and Innovation Units (UCC+i Network) as an accredited member and is dedicated to disseminate and spread the scientific content generated at the scientific facility, coordinate and promote outreach projects, publicize the facility through its visit or open doors program and promote scientific culture: https://www.cells.es/es/divulgacion/ucc-i

7. Synergies with other public intervention policies or instruments

Although the ALBA synchrotron currently has 10 operational beamlines available to the scientific and industrial community, it has the capacity to accommodate up to 17. The continuous development of ALBA is a pressing need to ensure the optimal use of the large investments already made and to avoid the onset of a premature obsolescence process. In this sense, synergy with other policies and instruments of public intervention is essential. In fact, in addition to the XAIRA and NOTOS beamline object of this project, the ERDF funds of the Catalonia ERDF Operational Program 2014-2020 have allowed to build two more beamlines and to address transversal improvement works for all the synchrotron beamlines.

On the other hand, the increased capacities provided by the operation of these new beamlines will allow the attraction of more scientific and industrial users that will contribute to increase the synergy with the instruments that they have to finance the R&D&I projects under study in ALBA's experimental lines.

In addition, the ALBA synchrotron has also obtained grants for the promotion of youth employment and implementation of the Youth Guarantee in R&D&I (State Program for the Promotion of Talent and its Employability in R&D&I), which has allowed many young people to train in a highly technological and cutting-edge environment.

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