

NEXT GENERATION

Next Generation EU are the funds agreed by the European Council in July 2020 as an extraordinary instrument for tackling the economic and social consequences of the pandemic. In order to implement part of these funds, the Ministry of Science and Innovation has created the Complementary Plans with Autonomous Communities (AC) for R&D&i activities, which means that each autonomous community co-funds the projects by contributing around 50% of the money. Eight priority areas have been established, and the Ministry has designated Catalonia for participation in four of them (astrophysics and high energies, biotechnology applied to health, advanced materials and quantum communication). "This has meant a major budgetary effort for the Government of Catalonia, although our participation was never in doubt; it is an opportunity", assured Iolanda Font de Rubinat, the Deputy Director General of Research. These four programmes have a total of €195 million to spend in a period of three years: €121 million from European funds, and the rest from the Autonomous Communities, with Catalonia's contribution being €27 million.

ASTROPHYSICS AND HIGH ENERGIES

Advanced technologies for exploiting the universe and its components

Ramon Miquel, the director of the Institute of High Energy Physics (IFAE), is coordinating the project at both a Catalan and Spanish level.

WHO

In Catalonia, there are five organisations involved, three of which have a greater involvement: The IFAE, which is also coordinating the project; the Institute of Cosmos Sciences, a research institute linked to the University of Barcelona; the Institute of Space Sciences, which is a CSIC centre, and the Institute of Space Studies of Catalonia. And two other institutions, the Polytechnic

University of Catalonia's Instrumentation in Nuclear Physics research group and the Barcelona Institute of Materials Science, a CSIC centre.

WHAT

The idea is to carry out a series of actions to (1) develop advanced technologies for the next generation of astrophysics instruments used to study the universe (telescopes or cameras), and (2) for the next generation of particle physics experiments carried out in particle accelerators such as CERN. All of these projects generate a massive quantity of data, dozens of petabytes, which require specific management. Another of the essential research areas will be (3) the fine-tuning of tools that make it possible to manage all of this information, and (4) the design, construction and launch of nano-satellites which include a telescope to observe space by rapid scanning and detect exoplanets.

BIOTECHNOLOGY APPLIED TO HEALTH

The development of tools for diagnosis, prognosis and advanced or targeted therapies in personalised medicine.

Josep Samitier, director of the Institute of Bioengineering of Catalonia (IBEC), is coordinating the project for Spain, focusing on biotechnology applied to health.

WHO

The Autonomous Communities that have joined the project are Catalonia, Extremadura, Castile La Mancha, the Basque Country, Galicia, Aragon and Andalusia. Various institutions from each community are taking part, including basic research centres and clinical organisations. One of the project's goals is to foster cooperation

among Autonomous Communities and use the resulting synergies to improve territorial cohesion.

WHAT

The programme focuses on research and innovation in various health fields. The goal is to (1) advance personal targeted medicine. Making full use of advances in genomics, 3D printing, nanotechnology, organoids and biomodels, along with the analysis of patient data, in order to develop more personalised therapies, offering patients better treatments at the most opportune time, while also serving to make an early diagnosis. It also aims to exploit the fact that it is an ambitious project, with one of the biggest budgets in this field, (2) to purchase equipment that, when the project finishes, will remain in the Autonomous Communities, and enable the creation of platforms that provide services for the whole scientific community.

ADVANCED MATERIALS In-CAEM (In-situ for Advanced Materials for Energy)

Caterina Biscari, the director of the ALBA Synchrotron, is coordinating the project in Catalonia.

WHO

In addition to the Synchrotron ALBA, the centres most directly involved in the construction of the infrastructure are the Catalan Institute for Nanoscience and Nanotechnology (ICN2), the Barcelona Institute of Materials Science (ICMAB-CSIC) and the Scientific Information Port (PIC), a centre for processing high-performance scientific data.

WHAT

A new facility is being developed, which will be part of the advanced microscopy centre to be launched in collaboration with other centres. The new facility is an electron microscope for tracking and transmission -TEM microscopy- in order to study complex advanced materials dedicated to the challenges established by the European Green Deal. These are smart materials and nanostructures that will be useful for issues relating to energy, electronics, ICT, health and quantum technologies. Launching the infrastructures envisaged for the programme will benefit all of the centres, for both strategic users in Catalan institutions and those that take part by entering through public tenders.

QUANTUM COMMUNICATIONS Quantum Communications coordinated programme

The coordination of the first half of the project will be carried out by Professor Vicente Martín from the Polytechnic University of Madrid, and the rest will be coordinated by Valerio Pruneri, ICREA professor from the Institute of Photonic Sciences (ICFO).

WHO

The autonomous communities taking part are Castile and Leon, Catalonia, Galicia, Madrid and the Basque Country.

WHAT

There are various goals, all of which are related to each other, in order to achieve the final objective of a quantum internet. The main theme is dedicated to (1) developing the technology via EUROQCI, a European infrastructure for quantum communications, its deployment and implementation. In order to carry this out, it is necessary to develop (2) hardware and software for quantum communications and (3) quantum processing. It is proposed to tackle some of the paradigms that now seem most promising for the development of quantum computation and quantum processing of information based on qubits, their basic elements.

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