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BUENAS PRÁCTICAS

Actuaciones Cofinanciadas

Consolidation and evolution of CSIC's clean room
micro and nanotechnology infrastructures

Spanish National Research Council (CSIC)

**Programa Operativo
Plurirregional de España**

Año 2022

Fondo Europeo de Desarrollo Regional

Consolidation and evolution of CSIC's clean room micro and nanotechnology infrastructures.

The Integrated Micro and Nano Fabrication Clean Room of the National Microelectronics Center (CNM) of the Spanish National Research Council (CSIC) located in Barcelona is part of MICRONANOFABS, a Singular Scientific and Technical Infrastructure (ICTS) that is part of the current ICTS Map, approved by the Council for Scientific, Technological and Innovation Policy. This ICTS is constituted with the aim of coordinating and bringing together the existing resources of a series of geographically distributed and diversely owned infrastructures, which form a unique and strategic set of capabilities in Spain in the field of microelectronics, nanoelectronics, optoelectronics, photonics and their applications, offering competitive open access mechanisms in a coordinated manner in order to increase the critical mass, improve national competitiveness and avoid duplication and redundancies.

The purpose of this project is to adapt the CSIC clean room to the new challenges of the research being carried out in the field of micro/nanotechnologies, with the additional objective of being able to be the basis of technological innovation of the national industry in the future. The funding for its execution has been articulated through two collaboration agreements between the Ministry of Science and Innovation (MCIN) and CSIC signed on October 10, 2017 and July 3, 2020. The overall budget for the project was a total of 14,753,000 euros, of which ERDF contributes 7,376,500 euros from the funds allocated to the General Secretariat for Research, from the Multi-regional Operational Program of Spain 2014-2020 for projects for the construction, expansion, improvement, renovation, remodeling or replacement of Singular Scientific and Technical Infrastructures included in the current ICTS Map.

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

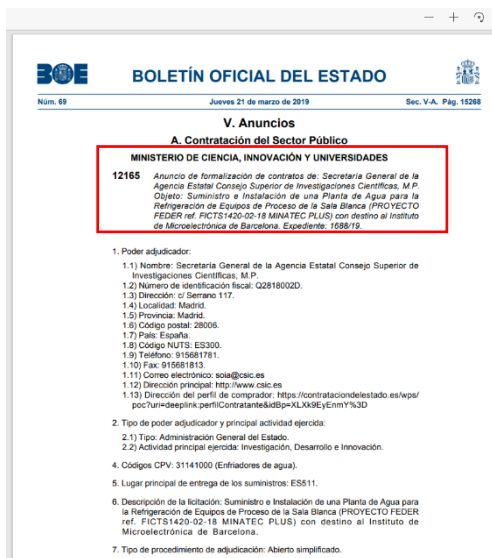
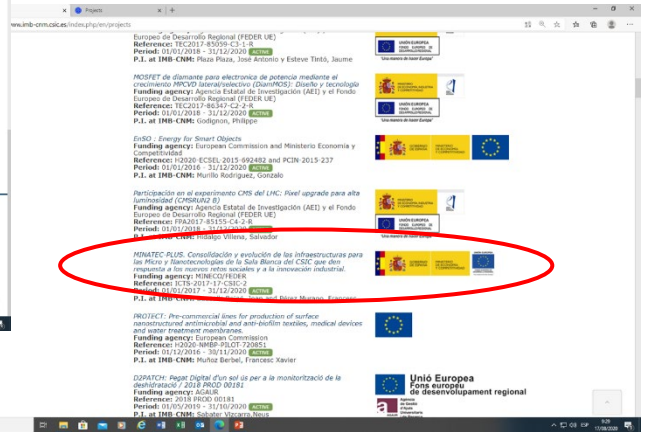
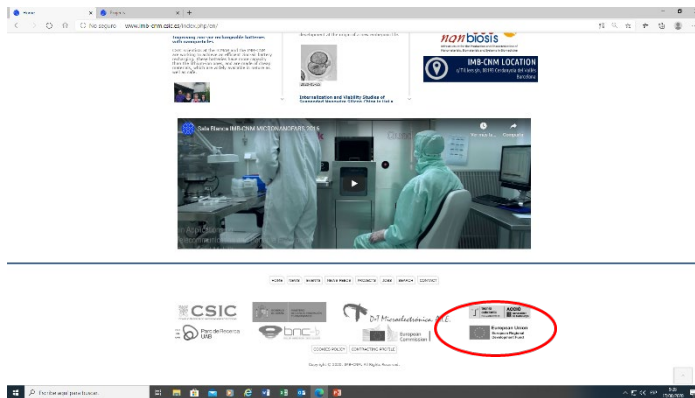
1. High outreach to beneficiaries and the general public

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 and 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.



MICRONANOFABS and the CNM (CSIC) include on their web page images proving the support received from the European Regional Development Fund.:



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

Signage at the access to the facilities:



Social Media Communication with *Hashtag* #fondos FEDER



Labels with ERDF logo and slogan on purchased equipment:



En toda la documentación técnica y protocolos de utilización del equipamiento adquirido:

CSIC **Profilmeters** **LEIRE MARTÍNEZ DE OLCOZ SAINZ** **CSIC**

INSTALLATION & START UP II:

Start Up (15-16/01/2018)
 Vienen los técnicos de la casa (Dominique Lecot y Bo Jiang) y desembralan los equipos y los entran a Sala con ayuda de Xavi Mas, Antonio Prieto, Carlos Seisdedos, Miguel Zabala y Leyre Martínez de Olcoz. Una vez dentro, se ubican en las zonas convenientes y se conectan a los servicios y se hace el primer test. El miércoles viene el comercial Javier Ledesma

Aceptación (15-16/01/2018)
 Test realizados:
 ✓ Ruido de escaneo
 ✓ Medidas de escalones: Precisión y repetitividad
 ✓ Repetitividad del posicionamiento de la plataforma.

CSIC **Profilmeters** **LEIRE MARTÍNEZ DE OLCOZ SAINZ** **CSIC**

CSIC **INSTALACIÓN CIENTÍFICA TECNOLÓGICA SINGULAR** **FEDER**
 Sala Blanca integrada de micro y nanofabricación
 Cod: 10U-VM20 **INSTALACIÓN&START UP** **Página 2 de 5**
EQUIPO: VM20

2. Servicios necesarios

Se requiere:

- **Potencia:** 100-120/220-240 V AC, 50/60 Hz, 100W max
- **Conexión de vacío:** 200mmHg, tubo de uretano OD 4 mm

3. Plano de ubicación:

El Microscopio Leica DM8000 se instala en la zona de inspección CMOS, concretamente en la posición C0 de Sala Blanca. El equipo se ubica dentro de una cabina cerrada, que cuenta con un sistema para introducir aire filtrado en forma de cortina vertical con el objetivo de reducir el contenido de partículas en el interior del recinto.

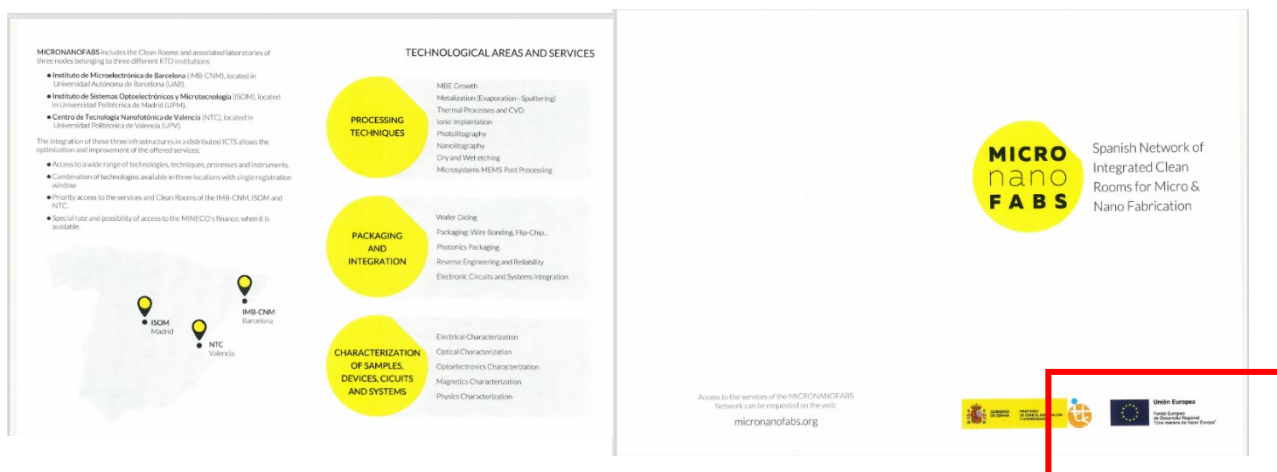
Debido a las dimensiones de la cabina, es necesario cambiar de ubicación tanto el NanoSpec 6100 como el CMT-SR200N Sheet Resistance.

© 2007 GICORC
 Autor: E. Giner
 revisor: 2011: C. Mateu

Autor: Samuel Dacosta
 Aprobación: 08/02/2019

BOE-6-2019-12165.pdf

Leaflet for dissemination of the technologies of this ICTS:



2. The project includes innovative elements

The CNM-CSIC Clean Room is the only scientific facility in Spain where complete integrated circuits and devices in MOS (Metal Oxide Semiconductor) technologies (based on CMOS technology, Complementary MOS, which was originally installed), as well as sensors, MEMS microelectromechanical devices and micro and nanosystems can be carried out.

(based on CMOS technology, Complementary MOS, which was originally installed), as well as sensors, MEMS microelectromechanical devices and micro and nanosystems. The renovation operation that has been carried out with this project allows to operate with new (bio)compatible materials and new types of substrates and of different sizes, advantages that are of great importance for applications of the devices for example in the field of biotechnologies, security, environment and energy.

3. Adequacy of the results obtained to the established objectives

The objective of this project has been the renovation and adaptation of many of the equipment in the clean room of the CNM-CSIC. The actions included in the first agreement signed have already been completed. The second agreement ends in June 2023

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

The project has managed to update the infrastructure available in the clean room of the CNM-CSIC so that it can continue to perform its function of technological support for the great diversity of applications it offers, which are very relevant for the research being carried out by the groups and companies that access the ICTS. Due to the age of the infrastructure, it was necessary to update it, especially its main instruments for the fundamental stages in the process of manufacturing chips or integrated circuits, such as doping, growth and deposition of materials, photolithography or etching, characterization of intermediate results, encapsulation, etc...

On the other hand, the RIS3 implementation strategy in the community of Catalonia, identifies within its main lines (Priority Axis 3) KET technologies as vital to support the local and international industrial sector. The strategic document points specifically to Nanotechnologies and Nanoscience and Photonics, as well as Microelectronics within the ICT umbrella as three of these priority technologies.

5. High degree of coverage of the target population

After proceeding to the improvement of the facility and its services, this clean room is better adapted to the current needs identified by the research groups and companies to which it gives value, it has sought maximum flexibility of use and the possibility of offering a wide range of technologies. All this will contribute to a better use by researchers and industry, which is the most direct target population.

On the other hand, the technologies developed in the CNM-CSIC clean room support the search for solutions to the main social challenges related to health, environment and energy, among others. Therefore, the improvement of infrastructures will have a positive impact on society in general by facilitating new implementations of micro- and nano-devices and systems to address solutions to different vital societal challenges such as aging citizens, climate change, clean and safe energy, Internet of Things (IoT), smart cities, efficient mobility, food for all, etc..

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

The CSIC has a Delegate Commission for Equality whose objective is to carry out a diagnosis of the situation of gender equality in the institution and propose actions in this area, and is also responsible for the development of the Plan for Equality between women and men in the CSIC. The Plan currently in force was published in the BOE in January 2021. [Disposición 2 del BOE núm. 1 de 2021 \(csic.es\)](#). It has also adopted the "Guide for a non-sexist use of language" prepared by the Universidad Autónoma de Madrid. [Guía para un uso no sexista de la lengua en la Universidad Autónoma de Madrid \(csic.es\)](#)

As a social responsibility within its scientific activities, the CNM-CSIC pays special attention to ensure that the use of the technologies developed there considers gender aspects in their applications, identifying the gender dimension in the development of its new technologies. In addition, they have active policies of dissemination of research results to students and young people to promote their interest in scientific activity, especially among the female part of this population

7. Synergies with other public intervention policies or instruments

The updating of capabilities provided by the project 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 this clean room.

In addition, this clean room participates in many international projects and contracts, mainly from the European Commission, (according to CDTI data the CNM is one of the institutions with more return of Framework Program projects in its area). It should also be noted that CSIC has an Economic Interest Association (AIE) together with some of the main Spanish companies interested in the use of Micro/nanotechnologies in their products. Its name is D+T Microelectrónica and its founding objective is to support and promote the use of these technologies at industrial level, which is another great instrument of intervention as a source of synergy.

On the other hand, recently the CNM-CSIC clean room has become part of EuroNanoLab, a European infrastructure distributed among 40 nanofabrication centers throughout Europe whose mission is to accelerate research in the nano and microtechnology sector, undoubtedly a great source of important international synergies.

It is also worth noting that, in the PERTE for microelectronics and semiconductors approved by the Council of Ministers at its meeting of May 24, 2022, the ICTS Micro and Nanofabrication Clean Room Network (MICRONANOFABS) is considered as one of the "Strategic Assets for the deployment of the PERTE". The Clean Room of the Institute of Microelectronics of Barcelona-National Microelectronics Center (IMB-CNM, of the CSIC) is its node with the highest capacities. As stated in the PERTE "Technical Report" (May 2022), *cuenta con personal propio que desarrollar diferentes proyectos de I+D, además de poner a disposición de la comunidad científica o empresarial su capacidad de prototipado y fabricación de pequeñas series orientada a dispositivos y sistemas*

electrónicos, principalmente en el ámbito “More than Moore”. Esta Sala Blanca cuenta con diferentes campos de trabajo, como la fotónica integrada, los semiconductores de gap ancho (para aplicaciones de potencia y ambientes hostiles), los micro y nanoelectrodos (para sensores químicos), tecnología de grafeno (biomedicina) o el micromecanizado de silicio (para aplicaciones MEMS²⁴). De esta manera, ha contribuido a desarrollar varios proyectos internacionales, incorporando tecnología propia para el CERN²⁵, así como diferentes constelaciones satelitales y misiones espaciales.

https://planderecuperacion.gob.es/sites/default/files/2022-05/PERTE_Chip_memoria_24052022.pdf

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