Centro Nacional de Microelectrónica (CNM)

Instituto de Microelectrónica de Barcelona(IMB)

Centre Nacional de Microelectrònica IMB

CSIC
Consejo Superior de Investigaciones Científicas

25
1985-2010

IMB-CNM Presentation

- **Centro Nacional de Microelectrónica**
- **Public Research Institute (CSIC)**
- **Located in Bellaterra, close to Barcelona (Spain)**
- **Devoted to Nano and Microelectronics**
- **Micro Nano Fabrication Facility (Clean Room)**

- **Departments:**
  - **Micro and Nano Systems**
    - Silicon sensors and actuators
    - Nanotechnologies
  - **Systems Integration**
    - Power devices
    - Circuits and systems design
    - Biomedical applications

IMB-CNM facilities

- **Clean Room**
  - **1.500 m², class 100 to 10.000**
  - **Micro and nano fabrication technologies**
  - **Three areas:**
    - Pure (CMOS)
    - Noble metals allowed
    - Nanoelectronics
- **Processes**
  - **4'' complete**
  - **6'' partial (no full thermal processes)**
- **Available technologies:**
  - **CMOS, BiCMOS, MCM-D, MEMS/NEMS, power devices**
  - **Bump bonding packaging**
- **Silicon micromachining**
- **Packaging**
  - **200 m², class 100**

- **Laboratories**
  - **Characterization and test**
    - DC and RF (up to 8 GHz)
    - Wafer testing
    - Thermography
    - Radiation testing
  - **Reverse Engineering**
  - **Simulation**
  - **CAD**
  - **Mechanical Workshop**
  - **Chemical sensors**
  - **Bio-sensors**
  - **Radiation sensors**
  - **Optical sensors**

Radiation Detectors group

- **People**
  - **6 permanent doctors**
  - **2 contracted doctors**
  - **4 PhD students**
  - **2 Engineer**

- **Activities started in 1996**
- **Experiments**
  - **Members of the RD50 CERN Collaboration**
  - **ATLAS, ATLAS upgrade (sLHC)**
  - **GRI (Gamma Radiation Imager)**

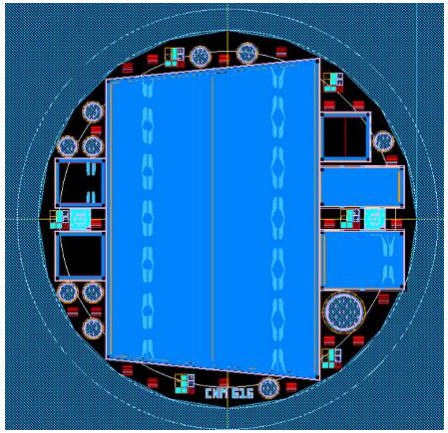
- **Contributions to Particle Physics – CERN**
- **Security**
- **Medical**
- **Space**

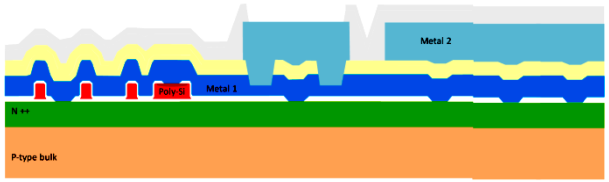
> **LabRad**
> **Flip Chip**
> **3D Printer**

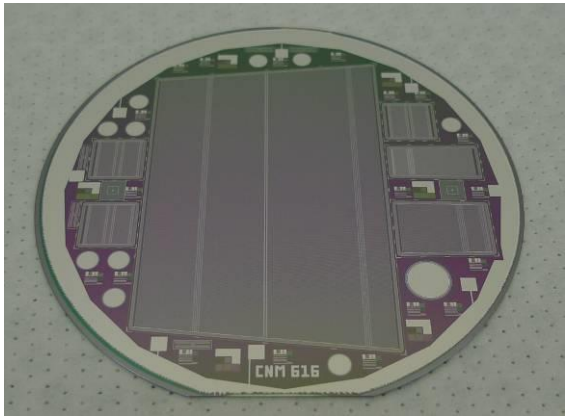
Application Oriented

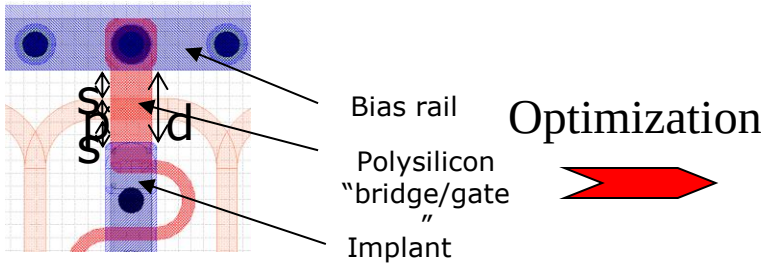
Particle Physics– Strip detectors

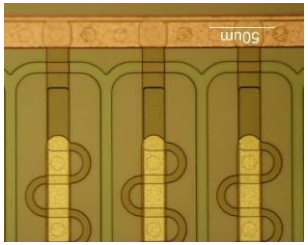
- **Design, fabrication and optimization**
  - **Design and fabrication of full ATLAS-like sensors**
  - **Fabrication of sensors for the ATLAS Upgrade End Cap prototypes**
  - **Fabrication of sensors for the RD50 Collaboration**





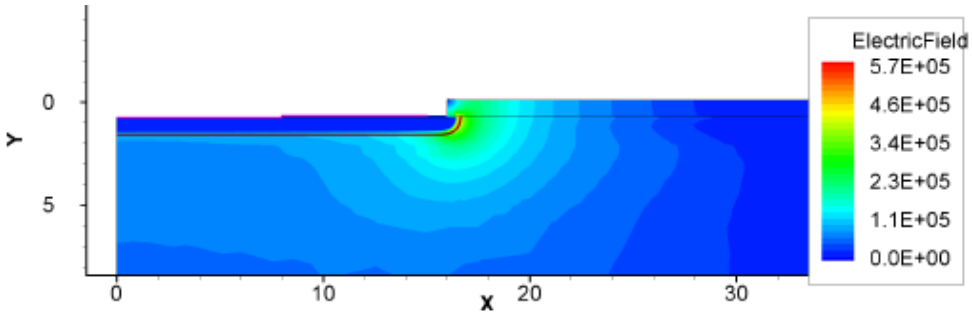


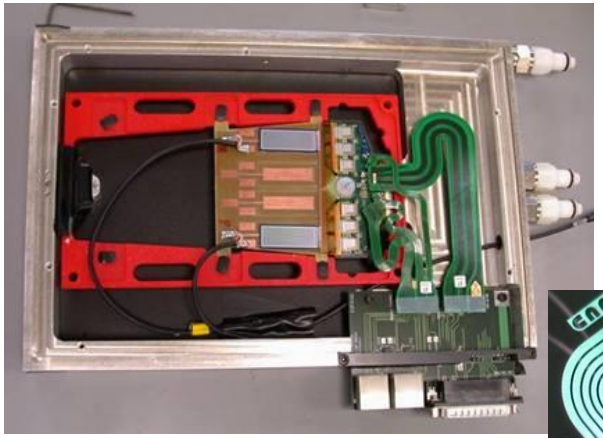


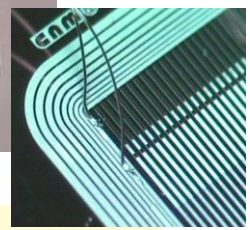


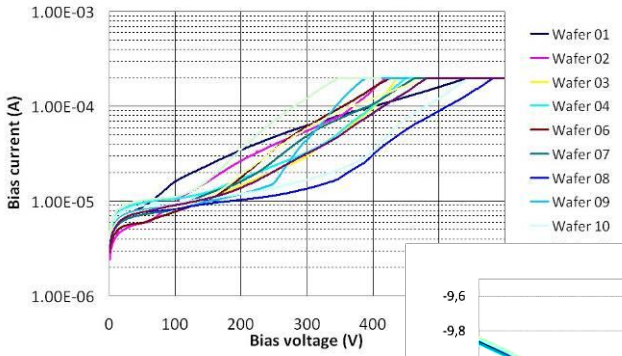
Particle Physics – Strip detectors

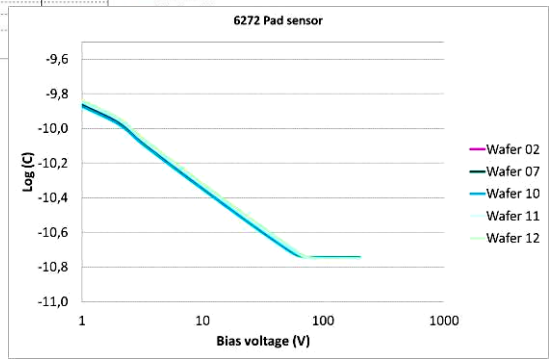
- **Simulation, characterization, irradiation**

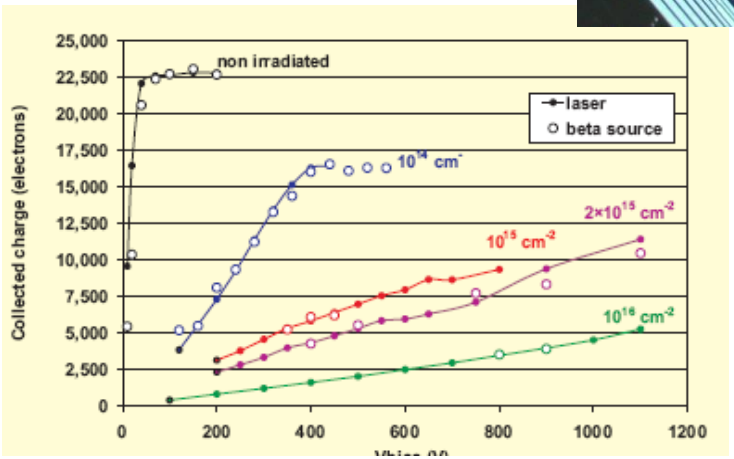






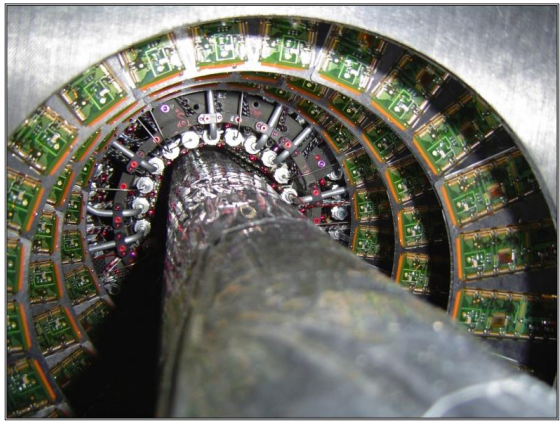


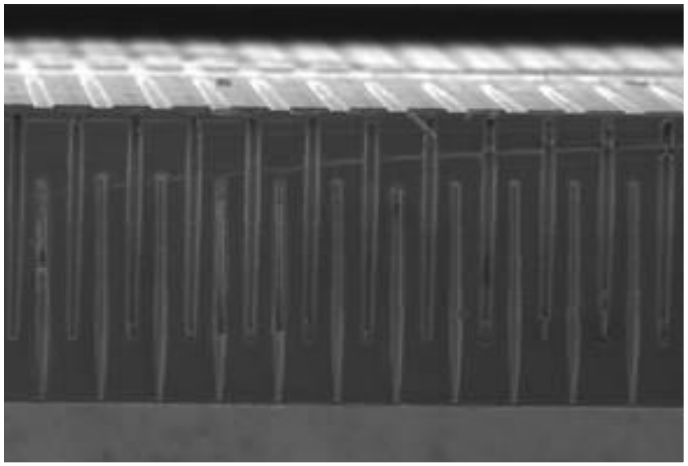


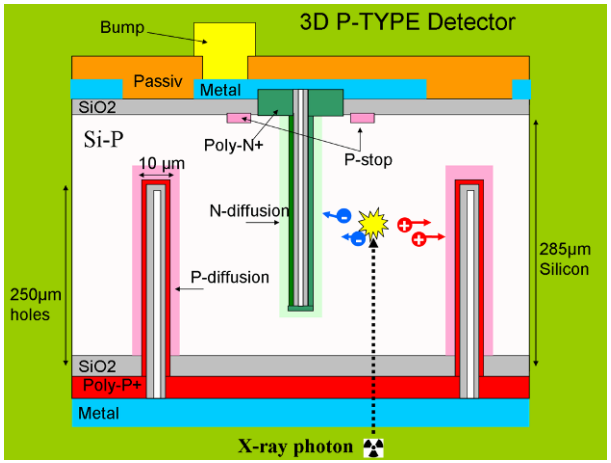


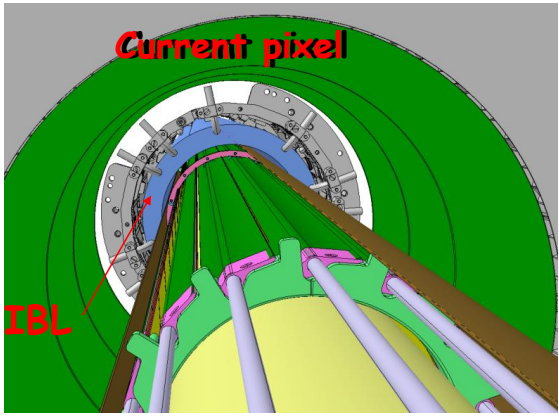
Particle Physics – 3D detectors

- **Development and construction of pixel detectors for the IBL and ATLAS Upgrade experiment**
- **Fabrication of 72 wafers/year between 2011 y 2012**



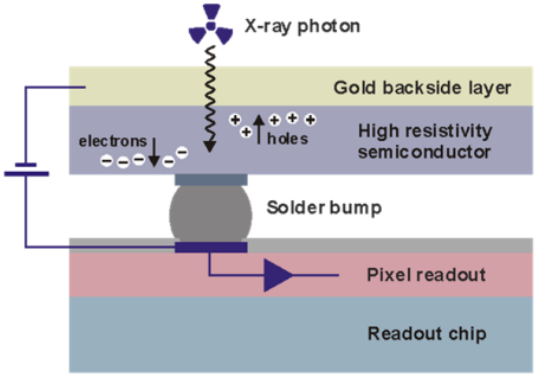


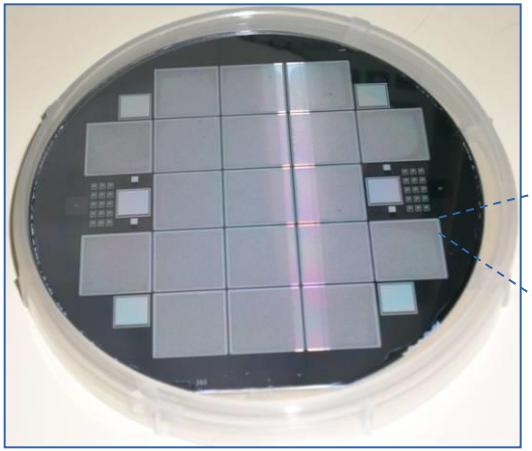


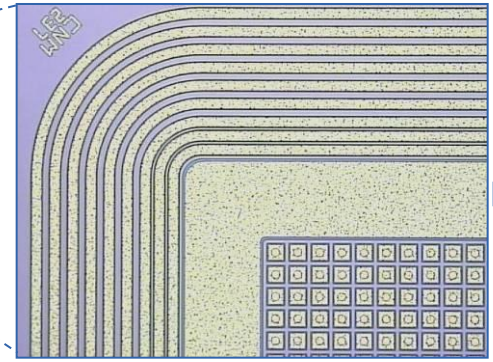


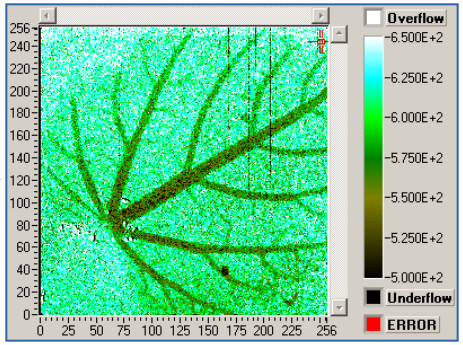
Particle Physics – Pixel detectors

- **Fabrication of pixel detectors in silicon**
- **CdTe detectors processing**
- **Bump bonding technology**
- **High density Flip-chip**







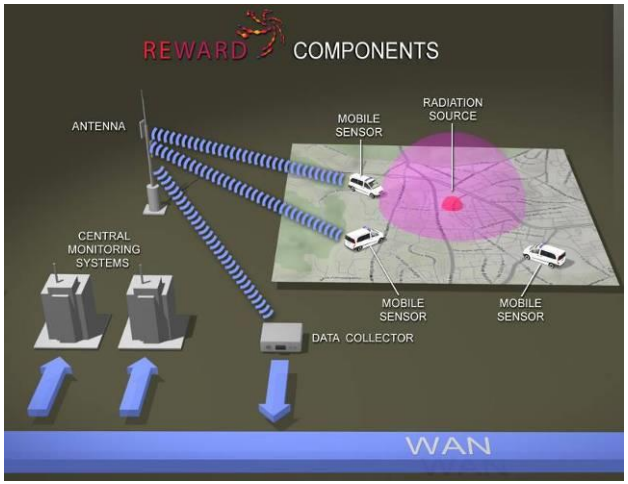


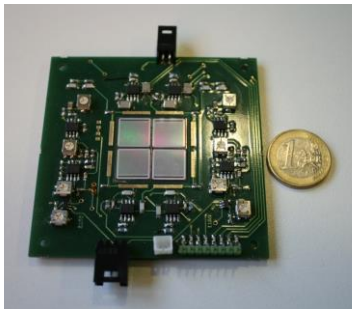
Security –REWARD Project

- Vehicle-borne autonomous units to detect radiation
- Radiation detectors for neutrons (Si) and gammas (CZT)
- Radioactive isotopes determination
- GPS localisation
- Secured communications(TETRA)
- Real-time processing data in a control center
- Objetive: to determine a radioactive area in real time

REWARD
Real Time Wide Area Radiation Surveillance System

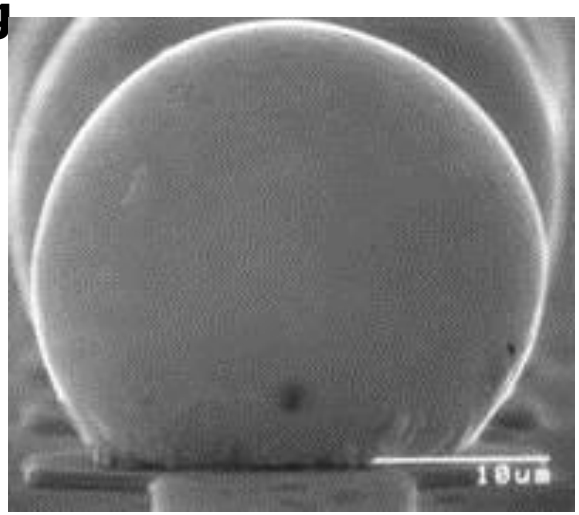
SEVENTH FRAMEWORK PROGRAMME

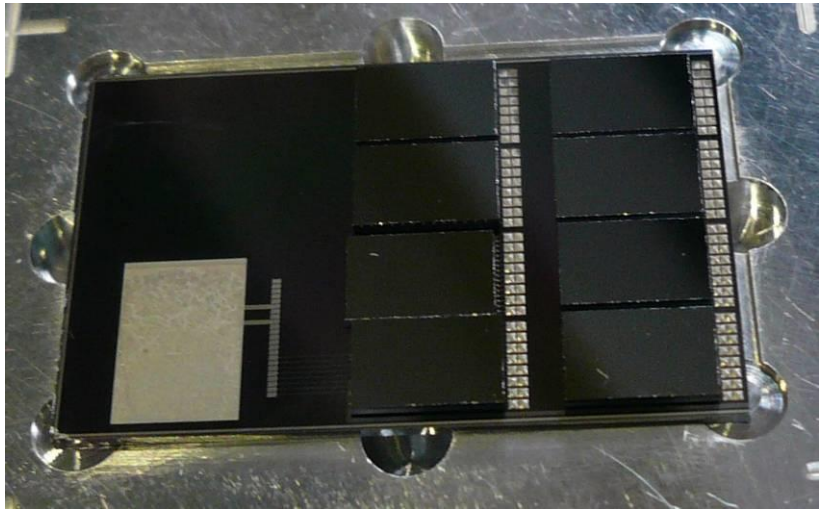


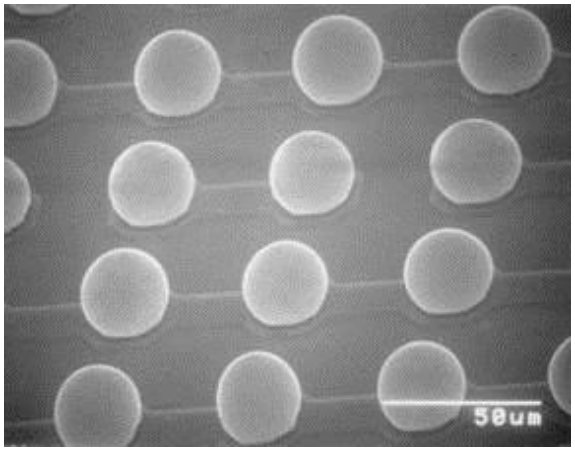


Flipchip Packaging

- Sn/Ag and Sn/Pb bump electroplating
- TiW/Cu electroplated UBM
- Ni/Au electroless UBM
- SET FC150 Pick&Place
- 1 micron placing accuracy
- Reflow in formic acid

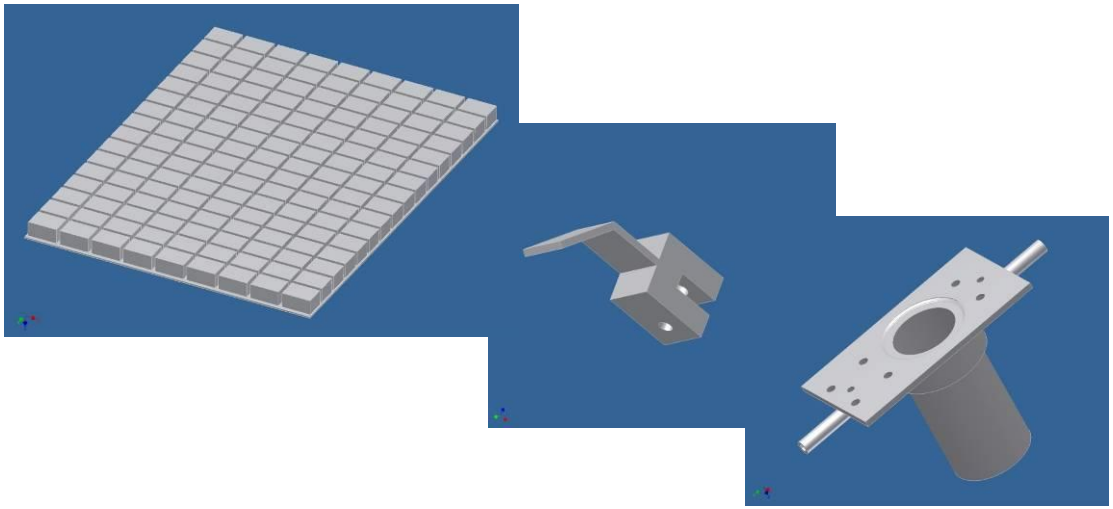






3D Rapid Manufacturing

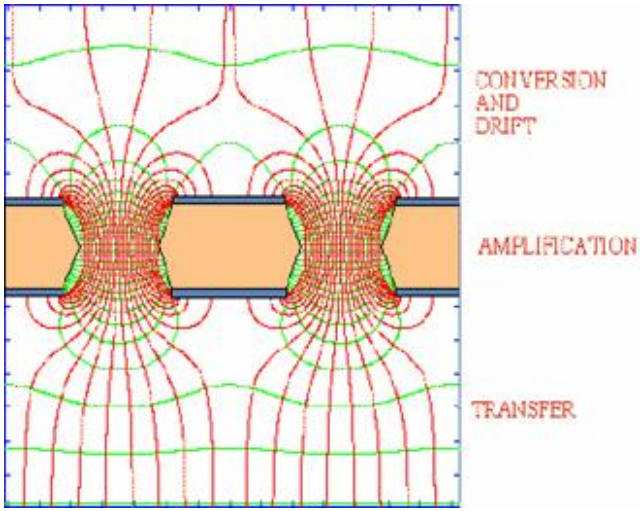
- **Polyamide Laser-sintering system**
- **EOS FORMIGA P 100**
- **From CAD to piece in few hours**
  - **Effective building volume: 20 cm x 25 cm x 33 cm**
  - **Resolution ~0.1 mm (vertical)**



Medical Applications– GEM Detectors

- **National funding for developing GEM detectors**
- **3-year project in collaboration with IFAE and HIP (observer)**

This is the reason to apply for CNM's membership into RD51 collaboration



GEM