

Mission

*Implementation of sensors on microelectronic (VLSI) technology and the necessary **digital** and **analog** electronic circuits (signal acquisition and power management) for their correct operation with **focus on low-power requirements**.*

Vision

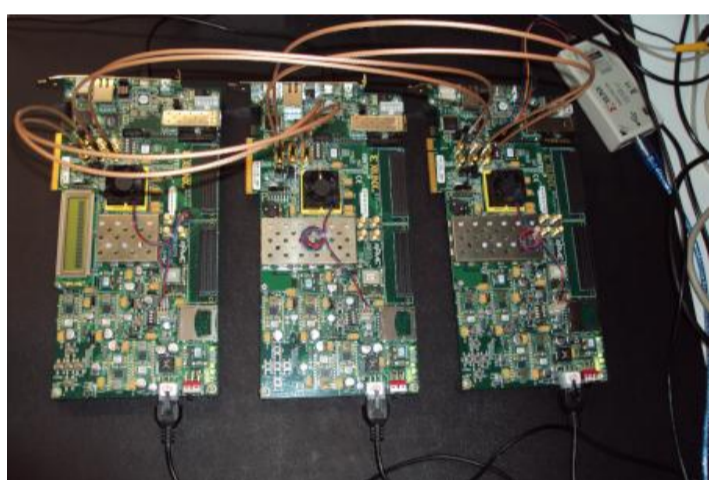
*The **most suitable technological solution**, such as **VLSI** and totally customized solutions, high density **FPGA** and programmable circuits, are **applied** to develop **intelligent electronic systems** to different areas, being health one of the most relevant.*

Group Profile

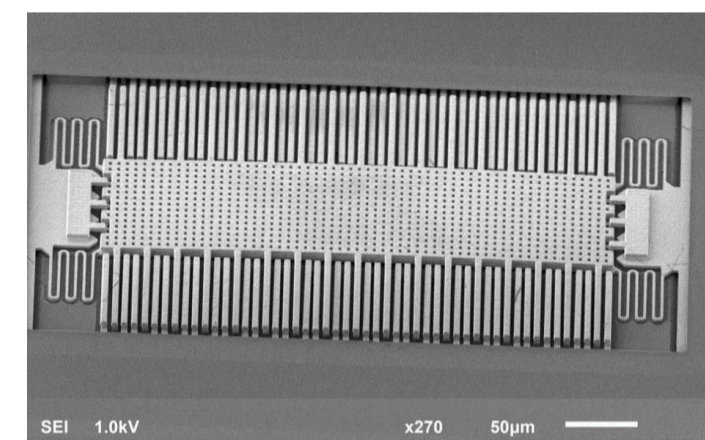
Recent / Ongoing Results

Research

- **CMOS MEMS Sensors**
 - Accelerometers, Pressure sensors, Magnetometers
- **Low-Power Electronics**
 - Power management and Signal acquisition
- **Bioinspired Computing and Spiking Neural Networks**
 - Implementation of SNN processors on silicon
 - Reconfigurable architectures
- **e-Health**
 - Interfaces and systems to improve healthcare



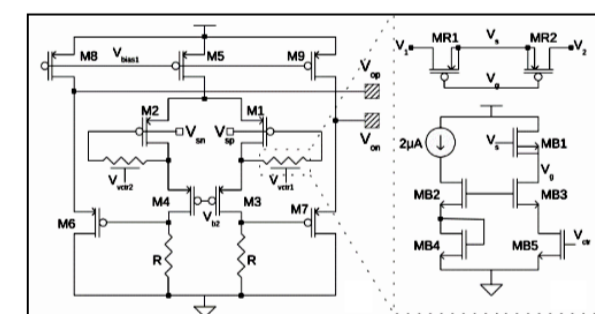
- **CGEMS (RTI2018-099766-B-I00)**: Advanced CMOS-MEMS integration for new generation millimeter-scale systems
- **SEMIoTIC (TEC2015-67278-R)**: Synergic and Efficient Multi-MEMS for Internet of Things Integrated on CMOS
- **PERPLEXUS (IST-2006-34632)**: Pervasive computing framework for modelling complex virtually-unbounded systems
- **REMPARK (FP7-287677-REMPARK)**: Personal health device for the remote autonomous management of Parkinson disease.
- **MEMSOC (TEC2011-27047)**: Micro-electro-mechanical System-on-Chip



Training/Teaching

- **Digital** and **analog** electronics
- **Microelectronic** design
- Real time DSP system design with **FPGA**
- Custom **smart adaptive** systems
- **Embedded** software and hardware for automotive

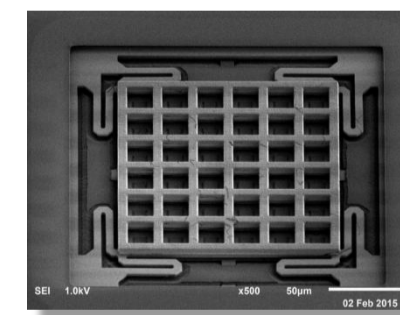
- **UPC**: Several courses on advanced digital design (HDL, FPGA and ASIC) in Master and Bachelor Degrees on Electronics
- **Company training: Digital design techniques for configurable devices (32 hours, +10 editions)**
- **Publications**:
 - Several books on basic electronics design, digital design and embedded design.



Innovation

- Development of several **CMOS MEMS**
- **VLSI Mixed-signal IP-blocs** Arquimea/ESA
- **Sense4care** spin-off (medical devices)

- **Four patents** on CMOS-MEMS and acquisition circuits
- **Two ADC IP blocs** designed for Arquimea/ESA consortium



Group positioning & Perspectives in front of Open-Hw & RISC-V

R+D+i+T

- Current R+I activities of the group are based on **ARM** processors on **PSoCs**
- **Migration to ASIC** is envisaged
- The use of open source processor cores would be necessary to avoid royalties of commercial cores.
- This adds the possibility of customizing the cores.
 - E.g. Spiking neural multiprocessor that is now controlled by an **ARM** core on an **FPGA**.
 - E.g. **CMOS-MEMS** integrated multisensor controlled now by digital hardware including **DSP** functions and embedded core.

Global Remarks

"The use of an open ISA allows researchers to customize their cores and implement them without the limits imposed by proprietary architectures."

"Multilevel embedded systems may benefit from open architectures to achieve more flexibility."