

## Centre of Industrial Electronics

The Centre of Industrial Electronics (CEI) is a research centre at the Universidad Politécnica de Madrid (UPM) created to generate knowledge and develop applications related to Industrial Electronics in cooperation with industrial partners. CEI activities focus on electronic system designs, both analog and digital. Research lines are related to power electronics, Radio Engineering and embedded systems.

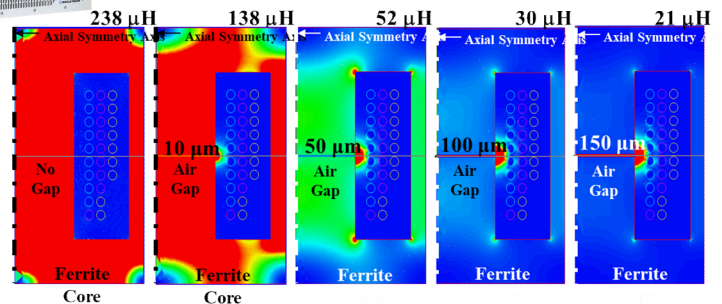
The centre participates in many projects with competitive public funding (H2020, ECSEL, RETOS Excelencia, RETOS Colaboración, RETOS Sociedad...).

CEI is recognised for the large number of direct collaborations with the industry and its international projection.

### Facilities and infrastructures

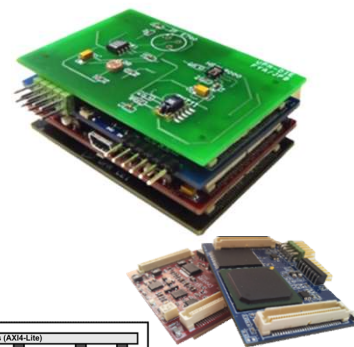


### 50KW Power Electronics Laboratory

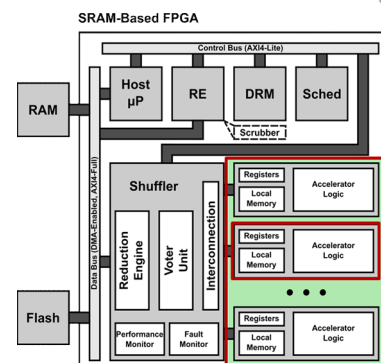


### Digital Embedded Systems

- ❑ Hardware-Software platform for IoT and WSN deployments in Smart Cities: **Cookies**.
- ❑ Runtime reconfigurable architecture for high performance and fault-tolerance computation: **ARTiCo<sup>3</sup>**.



- ❑ **Toolchains:** automatic generation of hardware accelerators in the reconfigurable architecture, planning, simulation and commissioning toolset for the Edge deployment of IoT.

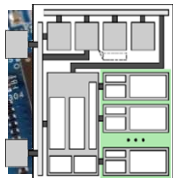


Hardware Accelerator Design

Reconfigurable Region Floorplanning

## Digital Embedded Systems

### Reconfigurable Hardware



Developing embedded parallel computing platforms based on HW acceleration, to obtain energy-efficient, scalable, and run-time adaptive solutions.

### Wireless Sensor Networks



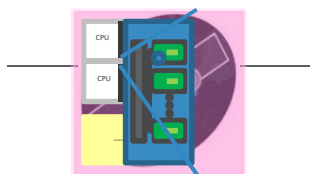
Wireless distributed systems applied to several scenarios such as smart traffic management, energy metering, agricultural control, urban participatory ...

### Internet of Things



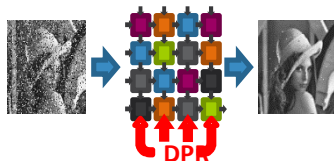
Networked embedded systems to face challenges related to the era of smart and sustainable cities, comprising the integration of heterogeneous hardware and software technologies.

### Heterogeneous Space Systems



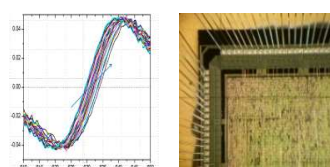
Systems that, at runtime and dynamically, adapt themselves to a variety of computing fabrics with particular attention in hardening to make them survive in harsh conditions.

### Embedded Intelligence



Embedded circuits that evolve and learn adapting to a task, resulting in autonomous, self-adaptive, and self-healing hardware suited to work under dynamic requirements.

### Expert Sensor Interfaces



Embedded circuits for advanced interfaces of complex sensors, based on HW/SW embedded signal processing and machine learning techniques

### Main projects in Big Science

- *The **European XFEL project**: supply of 240 power supplies for the upperconducting magnets of the main Linac. Spanish consortium: UPM CEI and CIEMAT.*

### Collaboration with Large European Scientific Facilities

- ***ESA**: research project of Modeling, Design and Validation of a novel Peak and Valley Control of DC/DC Power Converters. April 2020 - March 2021.*
- ***ESA**: PhD research stay on fault tolerance and mitigation techniques using SRAM-based FPGA hardware reconfiguration for Space.*
- ***CERN**: PhD Thesis on modelling and control of piezoactuators for high precision positioning systems used in radioactive environments.*
- ***ESA**: PhD Thesis (NPI programme) on safe reconfiguration of hardware accelerators on multi-FPGA platforms for Space applications.*
- ***ESA**: European Workshop on On-Board Data Processing. Conference contribution and presentation on reconfigurable architectures for on-board processing with adaptive fault tolerance using COTS MPSoCs.*

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