

Institute of Microelectronics of Barcelona IMB-CNM CSIC

The **IMB-CNM** is the largest institute in Spain dedicated to the research and development of Micro and Nano Technologies and Microsystems and with unique capabilities in silicon technology. It belongs to CSIC since its foundation in 1985 and is distinguished as a María de Maeztu Unit of Excellence.

IMB-CNM aims to contribute to the advancement of knowledge and to the economic and social development of society, as well as to the training of researchers and engineers and to the advice to public and private entities.

The research activities of IMB-CNM are dedicated to Micro/Nano Integrated Systems: miniaturized electronic systems which include sensing and/or actuating capabilities in addition to electronic information processing, power management and external interfaces.

The IMB-CNM is located on the Autonomous University of Barcelona (UAB) Campus and contains the largest clean room facilities in Spain with full capability to process its own CMOS technologies and laboratories.

Project Type: TFG/TFM

Project Title: A High-Resolution Audio ADC IP Block in 22nm CMOS Technology for RISC-V Systems-on-Chip

Research Group: Integrated Circuits and Systems (ICAS)

Project Description:

- ❖ The role of edge-of-the-cloud devices and the corresponding generation of big data are expected to include more than 10% of the world economy by 2030. In general, the massive deployment of ubiquitous smart sensing SoCs requires cost-effective power-efficient A/D converters (ADCs) capable of dealing with large dynamic range signals (typ. >80dB) but with practical bandwidth values not exceeding the kHz range in many applications.
- ❖ Oversampling Delta-Sigma ($\Delta\Sigma$) modulators are well-suited ADC architectures for these scenarios. This work will design a 16-bit 20-kHz $\Delta\Sigma$ ADC circuit as a mixed-signal IP block in 22-nm 0.8-V CMOS technology. Design efforts will be focused not only on low-power operation and compact area, but also on technology and voltage supply scalability.
- ❖ Furthermore, the ADC IP structure will ease its integration in a RISC-V SoC by including the analogue preamplifier at the frontend, so commercial audio microphones can be employed, together with a digital decimator and AXI-4 Lite slave at its backend.

Work Plan:

- The student will design the analogue, mixed-signal and digital parts of the $\Delta\Sigma$ ADC IP circuit in a given 22-nm 0.8-V CMOS technology following the full-custom and semi-custom IC design methodologies through Cadence EDA tools.
- Apart from low-power operation and compact area, the schematic and layout design will be optimized for its robustness against process-supply-temperature (PVT) variations.
- All the above tasks will be performed in the IMB-CNM lab facilities at the UAB Bellaterra Campus.

Candidate desired studies:

- ✓ MSc Semiconductor Engineering and Microelectronic Design

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- ✓ MSc Research and Innovation in Computer-Based Science and Engineering
- ✓ MSc Telecommunications Engineering
- ✓ BSc Electronic Engineering in Telecommunications
- ✓ BSc Industrial Electronics and Automation Engineering

Application Process:

Before applying, please **check with your TFG/TFM program supervisor**, as he/she may already be coordinating with us to assign the project.

If there is no such coordination, **complete this [form](#) and send your CV and a motivation letter to Talent@imb-cnm.csic.es, with the subject: “TFG/TFM at IMB-CNM”**

Your CV will be forwarded to the Researcher leading the project who will contact you directly if interested.

Check our website for more information about the IMB-CNM and our research activities

<https://www.imb-cnm.csic.es/en>

Take the next step in your research career with us!

*By applying, you accept our [data protection policy](#).

**IMB-CNM (CSIC) adheres to the [European Charter and Code of Conduct for Researchers](#), ensuring full alignment with their principles and requirements, including equal opportunity, transparency, merit and ability, caring for an open, fair, and excellence-based hiring processes.

IMB-CNM holds the [HR Excellence in Research award](#), which acknowledges CSIC's commitment to continuous improvement in HR strategies for researchers.