### Motivation and objectives of the research in this field

The scientific research in Astrophysics requires highly performant electronic instrumentation for space science missions aimed to study the fundamental phenomena in the Universe. Next generation Space X and Gamma ray observatories require advanced Application Specific Integrated Circuits (ASICs) for processing the weak signals of high sensitive radiation detectors (RD). The objectives of this research activity is the design and the experimental characterization of the next generation low-noise, low-power mixed signals CMOS ASICs for RD devoted to future Space Missions, in particular HERMES (http://hermes.dsf.unica.it/), THESEUS (https://www.isdc.unige.ch/theseus/) and eXTP (https://www.isdc.unige.ch/extp/).

### Methods and techniques that will be developed and used to carry out the research

The research activity will include all the phases related to the development of CMOS mixed-signal ASICs: from its conception to design, simulation, fabrication (external foundry) till its full experimental characterization. The PhD student will participate to the phase of the ASIC implementation in the detection module prototype for the satellite.

### Educational objectives

The PhD student will acquire skills in the design, simulation, layout and experimental characterization of the
analog and digital ASIC's sections. Professional simulators and laboratory instrumentation will be used. Collaboration with other PhD students and researchers in national and international research groups will complete the training.

Job opportunities

PhD laureate will be ready to consider job opportunities both in academic or research institutions as in companies requiring researchers or engineers skilled in mixed-signal CMOS integrated circuit design and/or in electronic instrumentation.

Composition of the research group

<table>
<thead>
<tr>
<th>Role</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Professors</td>
<td>0</td>
</tr>
<tr>
<td>Associated Professors</td>
<td>1</td>
</tr>
<tr>
<td>Assistant Professors</td>
<td>0</td>
</tr>
<tr>
<td>PhD Students</td>
<td>2</td>
</tr>
</tbody>
</table>

Name of the research directors

Giuseppe Bertuccio

Contacts

Giuseppe.Bertuccio@polimi.it
+39 031.332.7346

Additional support - Financial aid per PhD student per year (gross amount)

<table>
<thead>
<tr>
<th>Housing - Foreign Students</th>
<th>1st year</th>
<th>2nd year</th>
<th>3rd year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1500.0 € per student</td>
<td>1000.0 € per student</td>
<td>1000.0 € per student</td>
</tr>
</tbody>
</table>

max number of financial aid available: 2, given in order of merit ..

Housing - Out-of-town residents (more than 80Km out of Milano)

|                             | --       |

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

The main Laboratory in which the research activity will be carried out is the "Semiconductor Devices and Integrated Circuit Labs" located Politecnico di Milano, Como Campus, Via Anzani 42, 22100 Como. Each PhD student will be assigned a personal desk and a PC in the laboratory.

LIST OF UNIVERSITIES, COMPANIES, AGENCIES AND/OR NATIONAL OR INTERNATIONAL INSTITUTIONS THAT ARE COOPERATING IN THE RESEARCH: National Institute of Astrophysics (INAF); Italian Space Agency (ASI); Italian Institute for Nuclear Physics (INFN); European Space Agency (ESA); University of Udine and INFN Trieste; Fondazione Bruno Kessler FBK, Trento.

Within the collaboration with other research groups, meetings and laboratory sessions will be
The PhD student will participate to national Workshops and to an International Conference.

About the research Director prof. Giuseppe Bertuccio:
https://www.deib.polimi.it/ita/personale/dettagli/91650
https://www.deib.polimi.it/ita/notizie/dettagli/806

EDUCATIONAL ACTIVITIES (purchase of study books and material, including computers, funding for participation in courses, summer schools, workshops and conferences): financial aid per PhD student per year
- 2nd year: euros per student (1534)
- 3rd year: euros per student (1534)

TEACHING ASSISTANSHIP: (availability of funding in recognition of supporting teaching activities by the PhD student)
There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.

COMPUTER AVAILABILITY:
- 1st year: individual use
- 2nd year: individual use
- 3rd year: individual use

DESK AVAILABILITY:
- 1st year: individual use
- 2nd year: individual use
- 3rd year: individual use