



# PhD in INGEGNERIA DELL'INFORMAZIONE / INFORMATION TECHNOLOGY - 40th cycle

Research Area n. 2 - Electronics

**THEMATIC Research Field: SPAD CAMERAS FOR ULTRA-FAST TIME-RESOLVED  
APPLICATIONS**

**Monthly net income of PhDscholarship (max 36 months)**

**€ 1400.0**

In case of a change of the welfare rates during the three-year period, the amount could be modified.

## Context of the research activity

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

BANDO PRIN 2022/ALIAS - ID: 2022Y9YP9C - CUP:  
D53D23001560006

The PhD research will focus on the design of Single Photon Avalanche Diode (SPAD) cameras for different imaging techniques (e.g., spectrally resolved imaging, 3D imaging, Non-Line-of-Sight Imaging) within the ALIAS (Autofluorescence Lifetime Imaging And Spectroscopy for clinical and cultural heritage diagnostics) and ENLIGHTEN (European Non-Line-Of-Sight Optical Imaging) projects. The developed SPAD cameras will be characterized by different form factors (both linear and planar arrays), picosecond timing resolution, few microseconds frame time, and high count rates, with the objective to push all these parameters beyond the present state of the art.

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

The SPAD arrays will be designed and fabricated in very innovative CMOS technologies, which allow to optimize both SPAD and front-end electronics performance. The camera systems will be optimized for the specific applications, and experimental measurements will be led in collaboration with international end-users with well assessed expertise in the field.



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| <b>Educational objectives</b>            | The PhD student will acquire in depth skills for designing and simulate high speed circuits, programming FPGAs and microcontrollers, developing Graphical User Interfaces and developing optical set-ups for different imaging techniques. The doctorate activity will include attendance of academic courses, conferences, summer schools and workshops. |
| <b>Job opportunities</b>                 | The research project will open many opportunities in the field of electronic circuit design, both as digital and analog designer, giving the possibility to proceed further in a researcher position or to work in a company.   |
| <b>Composition of the research group</b> | 1 Full Professors<br>2 Associated Professors<br>1 Assistant Professors<br>7 PhD Students  |
| <b>Name of the research directors</b>    | Prof. Federica Alberta VILLA, Prof. Alberto Tosi  |

#### Contacts

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alberto.tosi@polimi.it

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

|   |    |
|---|----|
| <b>Housing - Foreign Students</b>                                     | -- |
| <b>Housing - Out-of-town residents (more than 80Km out of Milano)</b> | -- |

#### Scholarship Increase for a period abroad

|                            |         |
|----------------------------|---------|
| <b>Amount monthly</b>      | 700.0 € |
| <b>By number of months</b> | 6       |

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

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.

TEACHING ASSISTANTSHIP: 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: Yes

2nd year: Yes

3rd year: Yes

PREMIALITY

Premialities will be recognized to the PhD candidate:i) up to 2,500.00 euro (gross amount) after completion of the I year, provided that she/he demonstrates a significant contribution to the growth of scientific excellence, the industrial valorization of the research, the networking and communication activities of the research group and of the Department;ii) up to 2,500.00 euro (gross amount), after completion of the II year, provided that she/he has published at least one paper on a scientific journal and demonstrates a continuous and significant contribution to the growth of scientific excellence, the industrial valorization of the research, the networking and communication activities of the research group and of the Department;iii) up to 2,500.00 euro (gross amount), after completion of the III year, provided that she/he has published at least two papers on a scientific journal and demonstrates a continuous and significant contribution to the growth of scientific excellence, the industrial valorization of the research, the networking and communication activities of the research group and of the Department.

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