

ARTIFICIAL INTELLIGENCE

DM 630/Fondazione Bruno Kessler - Machine-learning-enhanced single-photon detectors

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| Context of the research activity | Explore machine learning strategies aimed at improving performance and characterization of SiC-based single-photon detectors. Progetto finanziato dal PNRR a valere sul DM 630/2024 - CUP: E14D24002330004 |
| Objectives | <p>Wide-bandgap semiconductors, increasingly adopted across several industry sectors, feature critical advantages also for photon sensing applications compared to state-of-the-art silicon detectors. In this context, Fondazione Bruno Kessler (FBK, Trento) is upgrading its internal clean room to process SiC wafers for sensing applications. FBK is a worldwide recognized leader in the field of silicon-based single photon sensors, such as Silicon Photomultipliers (SiPMs) and Single Photon Avalanche Diodes (SPADs). These detectors exploit the impact ionization mechanism, operating in Geiger mode above the breakdown voltage and achieving single photon sensitivity up to 70% and single photon timing resolution down to a few picoseconds.</p> <p>FBK and PoliTO are interested in exploring together SiC-based single photon sensors. The research topic of the PhD candidate will be to explore machine learning strategies aimed at improving both device design and characterization. The candidate will spend approximately half of its time at PoliTO and half at FBK under the supervision of world-class researchers in the field of semiconductor materials and detector development, having access to uncommon research facilities, such as a multiphysics device modeling environment including a 3D full-band Monte Carlo simulator, a clean-room for the study and fabrication of advanced semiconductor detectors and advanced electronics laboratories for the characterization of</p> |

single-photon sensors.

**Skills and
competencies
for the
development of
the activity**

Basic knowledge of semiconductor physics and operating principles of electronic/optoelectronic devices. Coding skills in a programming language / environment suitable for numerical analysis (Python, Matlab, C/C++ ...)