GRANT AGREEMENT
Project 101124288 — CompleX
(Call: ERC-2023-COG)

Titolo del progetto

Doping Compensation in Thin Silicon Sensors: the pathway to Extreme Radiation Environments (CompleX)

Codice CUP

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Project summary

Silicon sensors have been extensively exploited in high-energy physics experiments in the past 40 years, from their first use in NA11 at the SPS (CERN) to their application in the present-day design of very large particle trackers. The capability of silicon sensors to work in environments with high radiation levels has been of utmost importance for experiments at accelerating machines with very energetic and intense particle beams. Presently available silicon sensors can operate efficiently up to particle fluences of 2E16/cm2, while future frontier accelerators envisage the use of silicon sensors in environments with fluences exceeding 5E17/cm2. If not overcome, this gap will prevent the use of silicon sensors in future hadron-collider experiments. CompleX aims at extending the range of operation of silicon detectors by more than one order of magnitude, up to a fluence of 5E17/cm2. The idea behind this unprecedented target in radiation tolerance relies on a novel understanding of the saturation of the radiation damage and on the advantages that compensated implants bring to radiation hardness. The application of these two breakthroughs to thin silicon sensors (20–40 microns) with an internal gain of 10–20 will allow the design of sensors able to operate up to the target fluence. I am the PI of three projects to develop silicon sensors for extreme fluences (eXFlu – INFN, eXFlu-innova – AIDAinnova, FLEX – UNITO), which represent preparatory developments for the CompleX proposal. In this context, I introduced the principle of doping compensation in silicon sensors to the detector community. My expertise in the design and testing of silicon sensors, my involvement in radiation hardness studies, and my experience in project coordination qualify me as a recognised expert in the development of sensors for extreme fluences and enable me, as PI, to target the CompleX goals.