

# DPF-PHENO 2024

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## The Photo Detection Units of the DarkSide-20k experiment for WIMPs direct detection

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Dark matter, estimated to be 85% of the total mass of the Universe, remains a mystery in physics. Despite accumulating evidence supporting its existence, the true nature of dark matter is still elusive. One of the candidate's hypothesis are the Weakly Interacting Massive Particles (WIMPs). The search for WIMPs represents a real experimental challenge, has been running for more than a decade and has been pushing the limit further and further. The DarkSide program is part of this direct detection search and will continue with its next generation experiment, DarkSide-20k.

The DarkSide-20k detector will consist of a dual phase liquid Argon time projection chamber (LArTPC) surrounded by two veto inside a cryostat of  $8 \times 8 \times 8 \text{m}^3$ . It will be located in the Gran Sasso underground laboratory, providing a natural shielding from cosmic rays. The design has been made in order to minimize background and achieve a state of background-free operation, also allowed by strategy to suppress unwanted signals (such as neutrons, beta and gamma). This is made possible by leveraging the exceptional background rejection power of liquid argon thanks to pulse shape discrimination. The Photon Detection Units (PDUs) constitute a critical component of this design and will soon enter into production. Cryogenic and low-background silicon photomultipliers (SiPMs) will be employed for the project, undergoing rigorous testing before being assembled to build the PDUs at the Nuova Officina Assergi (NOA) cleanroom. This facility is located at the external laboratory adjacent to the underground site. All of this will lead to a very good sensitivity for the WIMP-nucleon cross section in yet undiscovered area of the parameter space.

### Mini Symposia (Invited Talks Only)

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