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# Monte Carlo biasing techniques in Liquid Argon Dark Matter experiment

*Tuesday, 18 March 2025 15:00 (5 minutes)*

DarkSide-20k is a background-free experiment under construction at INFN, Laboratori Nazionali del Gran Sasso, whose purpose is to directly detect Dark Matter particles exploiting WIMP-nucleon scattering in liquid Argon and an innovative active veto, which takes advantage of liquid Argon scintillation, to identify background neutron interactions. The construction specifications of the experiment are evaluated during the design phase through Monte Carlo simulations; however, simulating the transport of particles in large volumes is time-consuming, and the efficiency of these simulations is low, given the shielding materials the geometry comprises. Specifically, simulating neutrons originating from the underground hall where DarkSide-20k is installed requires a significant amount of computational resources. For this reason, Monte Carlo biasing techniques based on geometrical importance sampling have been implemented, to both enhance the accuracy of such simulations and reduce their run time. The conducted studies show that, with a suitable choice of the simulation parameters, it is possible to reduce the statistical error on the background event counts by a factor 15, achieving the same precision as standard Monte Carlo simulations while simulating a factor 500 less particles

**Primary author:** ROSSI, Matteo (Istituto Nazionale di Fisica Nucleare)

**Presenter:** ROSSI, Matteo (Istituto Nazionale di Fisica Nucleare)

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