

Material assay campaign of the DarkSide-20k experiment

Thursday, 11 July 2024 17:30 (20 minutes)

The DarkSide-20k experiment will search for dark matter in the form of WIMPs and has the potential to establish the most stringent limits for the spin-independent interaction of heavy WIMPs with nucleons. The background requirement of this experiment is less than 0.1 events in 200 tonne years, which ranks among the most rigorous ever set in the field of rare event searches and establishes stringent criteria in terms of radiopurity of the detector materials. During recent years, a comprehensive assay campaign has been conducted to assess the radiopurity of candidate components of the detector, with particular attention to the U and Th decay chains. Various assay techniques have been employed to detect the chain parents (ICPMS), the gamma emitters along the chain (HPGe), and the Po-210 content in the bulk of the materials. This approach allows for a systematic investigation of the secular equilibrium of the decay chain in all the materials. Special emphasis is placed on estimating neutron yields. A specific mass spectrometry campaign has been integrated into the contamination measurement to determine the chemical composition of the critical components of the detector, thereby reducing the uncertainty of the neutron yield produced through (a,n) reactions. Concurrently, SaG4n, a Geant4-based open code developed within the framework of DarkSide, has been developed and utilized to calculate the neutron yield induced by (a,n) reactions, with alphas primarily originating from the radioactive chains.

In this presentation, we outline the organization of the assay campaign along with its results to date, as well as the new (a,n) calculation techniques developed within the context of the DS-20k experiment.

Primary author: SANTORELLI, Roberto (CIEMAT)

Presenter: SANTORELLI, Roberto (CIEMAT)

Session Classification: Parallel 1

Track Classification: Parallel session: Direct detection