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The physics-driven surface background model for XENONnT

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The world-leading dark matter direct detection experiment XENONnT exploits a TPC-instrumented liquid Xenon active target of about 5.9 t.
In order to enhance the light collection efficiency, the TPC volume is delimited by diamond-tip shaved PTFE panels.
Radioactive isotopes contaminating these panels, directly in contact with the Xenon active mass, are responsible for generating the "surface background".
In particular, electrons and gammas originating from the decaying 210Pb, implanted in the PTFE when air-exposed due to the radon plate out phenomenon, contribute to the background budget for the WIMP signal search.
Differently from the other electronic recoil background sources due to the electrons collection on the PTFE panels, these events are characterized by a reduced ratio between ionization and scintillation signals, mimicking WIMP nucleus scattering events.
Traditionally, in order to reduce this background contribution, a fiducial volume cut is applied limiting the experimental exposure and hence the WIMP signal sensitivity.
The study presented probes the feasibility of implementing a physics-driven surface background model that could in principle allow the extension of the fiducial volume increasing the experimental exposure for the WIMP search.
Moreover, by exploiting the Flamedisx modelling and fitting framework the discovery power in case of detected signal is enhanced.

Submitted on behalf of a Collaboration?

Yes

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