

## Neutrino fog at CJPL

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The neutrino floor, a theoretical sensitivity limit for dark matter direct detections, is being redefined as the boundary of a dynamic “neutrino fog”, where neutrino signals become inevitable, obscuring DM detection due to the statistical and systematic uncertainties. This study provides the first site-specific analysis of the neutrino floor at China Jinping Underground Laboratory (CJPL), leveraging its unique geographic and environmental characteristics. We quantify how CJPL’s suppressed atmospheric neutrino flux (around 30% lower than Laboratori Nazionali del Gran Sasso) reshapes the neutrino floor, thereby enabling improved sensitivity to high-mass WIMPs (mass  $> 10\text{GeV}$ ). Using a gradient-based framework, we derive CJPL’s neutrino floor and estimate the detection prospects for the PandaX-xT experiment. Our results demonstrate that a 500 tonne-year exposure with PandaX-xT could touch the floor, probing spin independent cross-section down to  $\sigma_n \sim 3 \times 10^{-49} \text{cm}^2$  at a DM mass of  $70 \text{GeV}/c^2$ .

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