

Search for Boosted Dark Matter at Surface Detectors

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Searching for cosmic-origin rare new physics signals at Earth-surface-based detectors is usually challenging because of huge cosmic backgrounds.

In order to avoid such a challenge, underground experiments are thus strongly motivated.

If a signal of interest involves many features, however it becomes possible to isolate signal events from background ones.

Along this line, I discuss boosted dark matter (BDM) searches at ProtoDUNE putting a particular focus on the so-called inelastic BDM (iBDM) whose experimental signatures come with many features.

Moreover, if the expected signal signature is featureless, quarrying the rare signals out of cosmic backgrounds is believed almost hopeless.

However, I claim that surface-based detectors can achieve remarkable sensitivities even for featureless signals, by restricting to the events coming from the bottom side of the detector.

Potential cosmic backgrounds are thus significantly rejected while penetrating the Earth by the “Earth Shielding” effect.

To validate this “Earth Shielding” effect, I discuss the detection prospects of BDM as a benchmark scenario, at several surface experiments including SBN Program (MicroBooNE, ICARUS, and SBND) and ProtoDUNE.

Primary author: Prof. PARK, Jong-Chul (Chungnam National University)

Co-authors: Dr KIM, Doojin (CERN); Dr SHIN, Seodong (Yonsei University)

Presenter: Prof. PARK, Jong-Chul (Chungnam National University)

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