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Searching for Boosted Dark Matter via Dark-Strahlung

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I discuss an unprecedented search channel for boosted dark matter (BDM) signals coming from the present universe. The signal process is initiated by the scattering of high-energy BDM off an electron/nucleon. If the dark matter (DM) is dark-sector U(1)-charged, the scattered BDM may emit a dark gauge boson (called "dark-strahlung") decaying to a SM fermion pair. In fact, the existence of this channel may allow for the interpretation that the associated signal stems from BDM, not from the DM-origin neutrinos. I argue that despite its subleading nature, the BDM with a large boost factor may induce an O(10-20%) event rate of the lowest-order simple elastic scattering of BDM, in the parameter regions unreachable by typical beam-produced DM. I further claim that the dark-strahlung channel may even outperform the leading-order channel in BDM searches, especially when the latter is plagued by substantial background contamination. Finally, I discuss experimental sensitivities at DUNE far detectors, showing remarkable usefulness of dark-strahlung.

Preferred Session

Dark Matter

Comments

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