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A Search for Boosted Dark Matter with the Borexino Detector

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Experiments searching for elastic scattering of non-relativistic dark matter (DM) particles off nuclei lose sensitivity at DM masses below 1 GeV, since light particles transfer to nuclei energy below the detection threshold. Scattering off electrons enables partial probing of the region of lighter particles. Relativistic particles can arise from the acceleration of DM by cosmic-ray particles, the neutrino background, supernova emission, and a number of other processes. Boosted dark matter (BDM) particles can produce a detectable signal in existing neutrino detectors or DM detectors upon interaction with electrons or nuclei.

The Borexino solar neutrino detector possesses an important advantage associated with a record-low background level when searching for BDM signals in the few-MeV range. In the current work, we analyze the energy spectrum data of the Borexino detector [1, 2] with the aim of searching for events from BDM particles accelerated by cosmic-ray electrons and the diffuse supernova neutrino background.

1. M. Agostini et al. (Borexino coll.), Phys. Rev. D **101**, 062001 (2020)
2. D. Basilico et al. (Borexino coll.), Eur. Phys. J. C **86**, 736 (2026)

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