



Contribution ID: 11

Type: **not specified**

Supernova-Boosted Dark Matter at Large-Volume Neutrino Detectors

Saturday 15 November 2025 09:18 (18 minutes)

Core-collapse supernovae, among the universe's most energetic events, offer a novel window into the dark sector by potentially producing a flux of boosted dark matter (BDM). We explore the potential to detect the BDM produced by supernovae with a focus on fermionic dark matter that interacts with the visible sector through a dark gauge boson. Our results indicate that major current and future large-volume neutrino detectors DUNE, Hyper-Kamiokande, and JUNO can significantly constrain or discover BDM within compelling parameter spaces, with sensitivity notably enhanced during nearby supernova occurrences.

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Session Classification: Dark Matter