23rd International Workshop on Next Generation Nucleon Decay and Neutrino Detectors (NNN24)

Contribution ID: **21** Type: **Poster**

Exploring capabilities or argon-based detectors for supernova neutrinos

Stars originating core-collapse supernovae fuse elements until they reach iron. This element does not initiate the nuclear fusion process, as it is a reaction that consumes energy instead of releasing it. After a specific mass limit in the stellar core, the gas pressure cannot support the core, and the star implodes under gravity. During the process, neutronization occurs, producing neutrons and neutrinos in large quantities. Neutrinos are light particles with no electrical charge, interacting only through weak gravitational force. In this way, they can escape more easily from the star's core, carrying a wealth of information about the stages of formation of neutron stars, black holes, and neutrino oscillation. Several neutrino experiments will be prepared to detect these particles if the collapse occurs in or near the Milky Way. This work aims to study supernova neutrino oscillation and physics beyond these events' standard model (BSM). We simulate event rates using a software package called SNOwGLoBES (SuperNova Observatories with GLoBES) with a generic 40 kt liquid argon detector.

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Session Classification: Poster