



Contribution ID: 5

Type: Poster

Long-term supernova simulation with axion-like particles

Tuesday, January 28, 2025 4:40 PM (1h 20m)

Supernovae emit their energy mostly as neutrinos. If a galactic supernova occurs, some of thousands of neutrinos are likely to be detected in Super-Kamiokande (SK) for more than a minute. Supernovae have high temperature environments so that beyond standard model particles such as axions are likely to be produced. In this study, we implemented a supernova simulator with the effects of axion-like particles to calculate changes of neutrino emissions. Finally, I will discuss observation of neutrinos from such supernovae in SK.

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Session Classification: Poster Presentation