

Comparing Spherical Harmonics Analysis and Machine Learning Techniques for Double-Beta Decay Identification in a Large Liquid Scintillator Detector

In a liquid scintillator detector electrons from double-beta decay ($\beta\beta$ -decay) often exceed Cherenkov threshold. These Cherenkov photons carry information about event topology of the two-track single-vertex $\beta\beta$ -decay. Event topologies of background events are distinctly different by number of tracks and/or by number of vertices. Therefore signal/background separation can be achieved by analyzing spatial and timing distribution of photons on the detector surface. Using a simulation of a 6.5-m radius liquid scintillator surrounded by photo-detectors with 100-ps resolution we compare performance of the spherical harmonics analysis with machine learning (ML) techniques. Even with currently similar performance of the two methods we emphasize an advantage of the ML methods since they do not depend explicitly on vertex reconstruction. Therefore a dedicated effort in further development of the ML methods is needed.

Session and Location

Wednesday Session, Poster Wall #151 (Hölderlin room)

Poster included in proceedings:

yes

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Track Classification: Poster (not participating in poster prize competition)