Type: Invited Talk

Event classification based on spectral analysis of scintillation waveforms

Thursday 14 June 2018 11:30 (30 minutes)

Liquid scintillators are a very common tool for neutrino physics at MeV energies, due to their good light yield and timing. However, in large detectors their capability to perform efficient pulse shape discrimination for background rejection is often limited. In this talk I present a novel approach for event classification, which was developed in the context of the Double Chooz reactor antineutrino experiment. This method uses the Fourier power spectra of the scintillation pulse shapes to obtain event-wise information. A classifier variable built from spectral information was able to achieve an unprecedented performance, even though the detector was not explicitly optimized for pulse shape analysis. Example applications of this technique include the identification of the interaction volume and an efficient rejection of instrumental light noise. A certain sensitivity to the particle type was also demonstrated with stopping muons, ortho-positronium formation, alpha particles as well as electrons and positrons. In combination with other techniques this method is expected to increase sensitivity and to provide a versatile and efficient background rejection in the future, especially if detector optimization is taken into account at the design level.

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Session Classification: Novel methods and techniques