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Applications of the Topological Track Reconstruction to low energy events

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This contribution presents the application of the Topological Track Reconstruction (TTR) to low energy events of a few MeV and its capability for particle discrimination. In liquid scintillator detectors like the Jiangmen Underground Neutrino Observatory (JUNO) the low energy regime consists of electrons, positrons, or gammas, which are treated as point-like.

While positrons and electrons travel typically a few cm, the mean range of gammas can be up to 50cm. This yields the possibility to discriminate electrons and gammas directly via their travel range. Since positrons annihilate with the emission of two gammas the range can also be used to distinguish between electrons and positrons.

The discrimination of electrons and positrons gives the ability to suppress the background originating from β+ decays of cosmogenic isotopes in measuring solar 8B neutrinos, whereas the distinction between electrons and gammas comes in handy to suppress natural radioactivity in the detector.

The TTR is capable with both conventional and Machine Learning techniques to provide e+/e− and γ/e− discrimination. This makes the TTR an important tool for background suppression. This talk covers an introduction to the TTR, a motivation for particle discrimination, the used techniques and their results. In addition it gives an outlook for the application of the TTR to water-based liquid scintillator detectors.

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