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Background rejection with neural network for KamLAND-Zen

KamLAND-Zen is a neutrinoless double beta decay ($0\nu\beta\beta$) search experiment using ^{136}Xe. Taking advantages of the low-background environment of KamLAND, we realize the most sensitive $0\nu\beta\beta$ search.
While $0\nu\beta\beta$ is a pure β event, the backgrounds such as ^{214}Bi and spallation products emit γ-rays. Therefore, particle identification(PID) is effective to improve the sensitivity.
In this study, we develop a PID method with a neural network focusing on difference of scintillation timing property between β and γ.
It rejects gamma backgrounds based on hit-timing spectrum of PMTs.
We applied the method to hit-timing spectrum of MC and data of KamLAND-Zen400 Phase1, where ^{110m}Ag (gamma event) was the most dominant background. We found that this method could reject 60% of gamma backgrounds and had a potential of ~10% improvement of its limit.

Mini-abstract

Particle identification with neural networks can reduce the backgrounds of KamLAND-Zen experiment

Experiment/Collaboration

KamLAND-Zen

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