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Reconstruction with Water-based scintillator

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We proposed to build a Cherenkov scintillation detector with kilo-ton fiducial mass in China Jinping Underground Laboratory. We have made significant progress in developing the water-based liquid scintillator (WbLS) technique and optimizing the detector geometry. WbLS emits Cherenkov and scintillation photons for each charged particle. With the feature of the delayed scintillation light and the uniformity of the scintillation, we can separate two types of lights and rebuild particle energy and direction. We used Jinping simulation and analysis package to simulate uniform electrons in WbLS, the light yield of scintillation is set up to 240 photons/MeV, PMT coverage is 30%. Then we construct a complete optical model of Cherenkov+scintillation to reconstruct the vertex, energy, and direction according to the time and space profile of the scintillation and Cherenkov lights. For 5 MeV electrons, the reconstructed result shows that the angular resolution (the resolution is defined as 68% inclusion) is about 28 degrees, the energy resolution is about 11%. The one-dimensional vertex resolution is approximately 94 mm. In this way, we could suppress the backgrounds and improve the measurement accuracy of solar neutrinos.

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