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θ_{13} oscillation analysis in Double Chooz with two detectors

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The Double Chooz experiment is a reactor neutrino disappearance experiment located at the nuclear power plant in Chooz, France. The primary goal of the Double Chooz experiment is to precisely measure the neutrino mixing angle θ_{13} , a neutrino oscillation parameter. The experiment consists of two identical liquid scintillator detectors and measures the electron-antineutrino flux of the two nuclear reactors. The 1 km distant far detector started operation in 2011. The 400 m distant near detector started operation in the end of 2014. The reactor neutrinos are detected by the signature of an inverse beta decay (IBD). Inverse beta decay provides a unique prompt-delayed coincident signal to identify the electron antineutrinos from the reactors and the high correlation between the near and the far detector can significantly suppress the systematics. The neutrino energy spectrum is extracted from the spectrum of the IBD-produced positrons. The IBD-produced neutrons can be captured by Gadolinium or Hydrogen, which provides two independent data samples. Both samples allow the utilisation of the neutrino rate and energy spectral shape information in a combined fit. θ_{13} is extracted by a simultaneous fit to the data observed by the two detectors. To validate the measurement and suppression mechanism in the fit, multiple statistical methods as well as multiple fit configurations using the two detectors have been developed in Double Chooz. They are supplementary to each other to deliver a precise θ_{13} value. In this poster, these oscillation analysis methods and configuration will be shown. In addition, the systematics budget and the oscillation fit results will be described.

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