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Session 5: Reactor neutrinos

Double Chooz first multi-detector results

A Cabrera

Institut National de Physique Nucléaire et de Physique des Particules (IN2P3), France

The Double Chooz experiment (DC) is a reactor neutrino experiment running at Chooz nuclear power plant (2 reactors) in France. In 2011, DC first reported indication of non-zero θ_{13} with the far detector (FD) located at around oscillation maximum, thus challenging the CHOOZ limit. A robust observation of θ_{13} was followed in 2012 by the Daya Bay and RENO experiments with multiple detector configurations. In the single detector configuration, the precision of θ_{13} was totally dominated by the reactor flux uncertainty, using the Bugey4 data as effective normalisation. In the multi-detector configuration, the flux error becomes negligible (<0.1%), due to the unique iso-flux site configuration, where the ND (near detector) data directly provides an accurate un-oscillated reference to the FD. The dominant systematic is expected to be cosmogenic background related, due to the shallower overburden. However, even this error remains one of the best in the field due to the powerful background rejection per detectors developed as part of the analysis. The reactor- θ_{13} is expected to remain as the most precise for decades, relying on systematic uncertainties in the per mille level. Thus, multi-experiment (Daya Bay, DC, RENO) validation redundancy is critical to ensure the accuracy and precision of the measurement, which is reference for current and future projects sensitive to CP-violation and atmospheric mass hierarchy observables. Beyond oscillation physics, DC has articulated one of the most precise single-detector setups, allowing exploiting ND unprecedented physics. In this talk, we will present the first θ_{13} measurement with two detectors and high precision ND physics.