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Double Chooz Measurement of theta_13 and beyond

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Nuclear reactor neutrinos were used on the first neutrino detection back in 1956. Since then our knowledge on neutrino physics haven't stopped broadening, and reactor neutrinos are still an important source of investigation. The Double Chooz (DC) is an experiment on neutrino oscillation based at Chooz nuclear power plant in France. Back in 2011 the DC collaboration reported an indication of non-zero theta_13, the last unmeasured angle of the neutrino PMNS mixing matrix, for the first time using reactor neutrinos. This was confirmed and measured by independent experiments in the following year. The DC collaboration has improved its analysis over the last years, in order to reduce the uncertainty on theta_13 measurement. The use of a second detector, the Near Detector (ND), operating ~400 meters from the reactors, improves the sensitivity by its nearly iso-flux location, in comparison to the Far Detector (FD), around the oscillation maximum ~1000 meters. Further improvement is achieved by making both detectors identical, in order to highly suppress the detection induced systematics. DC is taking data with both detectors since January of 2015, and boosted the event statistics by a novel approach on the Inverse Beta Decay (IBD) selection, considering neutrons captures on Gadolinium and Hydrogen simultaneously, that increases the fiducial volume by more than three times. The precision and accuracy of theta_13 have a leading impact on the current explorations of the neutrino CP violation phase and atmospheric mass ordering, when combining all neutrino oscillation measurements in a global analysis. Thus the redundancy of multiple theta_13 experiments is critical, ensuring the findings robustness. In this talk the latest analysis and results towards theta_13 measurement by DC will be showed. The efforts of the DC collaboration beyond theta_13, will also be addressed.

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