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P4.078 Experimental study of decoherence effect with reactor neutrino experiment data

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The last unknown neutrino mixing angle has been successfully measured by the Double Chooz, RENO, and Daya Bay experiment. However, the standard formula for neutrino oscillation probability is based on neutrino plane-wave assumption, which is a good approximation but not a consistent model. Wave-packet treatment is necessary for a self-consistent description of neutrino oscillation phenomenon. The wave-packet description leads to delocalization, decoherence and dispersion effects, which modify the plane-wave neutrino oscillation pattern, by amounts that depend on the initial neutrino wave-packet width. The modified survival probability for electron anti-neutrinos is used to fit with the Daya Bay data. Since December 2011, Daya Bay has recorded more than one million reactor anti-neutrino interactions. This high-statistics data set allows us to study the wave-packet impact, to produce the first experimental constraint on the initial wave packet width, and to determine the oscillation parameters according to the wave-packet treatment. This poster will present our experimental study with the wave-packet treatment of neutrino oscillation, and show its impact in Daya Bay