Measuring θ_{13} with the Daya Bay Reactor Neutrino Experiment

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In the last ten years, several experiments have established neutrino oscillations. These experiments are consistent with a scenario where three active neutrinos participate in neutrino oscillations with six parameters: three mixing angles (θ_{12}, θ_{23}, θ_{13}), two differences of squared masses (Δm^2_{21}, Δm^2_{31}) and a CP phase (δ). Only the sign of Δm^2_{31} and the values of δ and θ_{13} remain unmeasured. The size of θ_{13} will determine whether future neutrino oscillation experiments will be able to measure the sign of Δm^2_{31} and probe the value of δ. Two complementary approaches to measuring θ_{13} have emerged. One can search for ν_e appearance in a ν_μ beam or one can search for $\bar{\nu_e}$ disappearance in a flux of antineutrinos from a nuclear power reactor. At the Daya Bay Nuclear Power Plant in China, we will build eight modules each containing 20 tons of gadolinium-loaded liquid scintillator to precisely measure the $\bar{\nu_e}$ flux at two locations near the reactor cores and one location about 2 km from the cores. The expected sensitivity after three years of running is $sin^2 2\theta_{13} \leq 0.01$ at 90% confidence level. I describe the relevance of θ_{13} to neutrino oscillation physics, the complementarity of the two measurement approaches and the Daya Bay Reactor Neutrino Experiment in detail.