Neutrino oscillation results from the T2K experiment and implications for the future

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The T2K (Tokai to Kamioka) experiment is a long baseline neutrino oscillation experiment designed to probe the θ_{13} neutrino mixing parameter by looking for the appearance of ν_e in an almost pure ν_μ beam. The concurrent measurement of ν_μ disappearance allows refined measurements of the atmospheric Δm^2 and of the θ_{23} mixing parameters. A neutrino beam is produced at the Japan Proton Accelerator Research Complex (J-PARC) in Tokai, Japan, and aimed at 2.5° off the direction of the Super-Kamiokande (Super-K) detector, 295 km away. The resulting narrow energy band neutrino beam at the Super-K location, peaked at about 600 MeV, is optimized to maximize the probability of oscillation at the atmospheric Δm^2 scale, minimizing at the same time the background for ν_e searches. Hadroproduction measurements from the NA61 experiment at CERN, specifically performed for the T2K experiment, are used for the prediction of the neutrino beam. The beam is monitored at J-PARC, at 280 m from the target, by an on-axis non-magnetic detector and by an off-axis magnetic near detector. Based on data accumulated from January 2010 to 11 March 2011, we present results on the search for ν_e appearance and measurements of ν_μ disappearance. We observe an indication of $\nu_\mu \rightarrow \nu_e$ appearance with a significance of 2.5σ, opening the way to searches for CP violation in the leptonic sector.