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Quest for CP violation in neutrino oscillations

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Neutrino oscillation shows that different flavours of neutrinos, νe, νμ, and ντ, mix like quarks. Thus CP violation is expected due to the complex phase in the mixing matrix as is in the quark case. Since the observables of CP violation, namely difference between neutrino and anti-neutrino oscillations, is proportional to the three mixing angles, sinθ12, sinθ23 and sinθ13, all the three angles need to be large enough for the CP violation to be accessible. Since the discovery of the first neutrino oscillation in 1998, all these three mixing angles have been observed to be surprisingly large. The last angle sinθ13 was observed by T2K long baseline neutrino and Daya Bay/Reno reactor neutrino experiments. Because the T2K observable is also sensitive to CP violation, the comparison between T2K and reactor experiments shows a hint of potentially large effect due to CP violation phase. If the CP violation in neutrino oscillation is indeed large, it could naturally explain the matter vs. anti-matter asymmetry of the universe. An extension of T2K is being proposed to discover this leptonic CP violation in the decade. In this talk, I will present the status and prospect of the CP violation measurement in neutrino oscillation.

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