

Parameter degeneracy and information loss in inverse flavor mapping for high-energy astrophysical neutrinos

Sunday, 25 October 2026 16:10 (20)

Given a high-energy astrophysical neutrino flux, its source flavor ratios $\eta = \{\eta_e, \eta_\mu, \eta_\tau\}$ are correlated with the ones $f = \{f_e, f_\mu, f_\tau\}$ measured at a neutrino telescope via $f = P\eta$, where the elements of P consist of four lepton flavor mixing parameters. But realistic inverse flavor mapping $\eta = P^{-1}f$ encounters unavoidable parameter degeneracy and information loss, especially in or near the $\det P = 0$ limit allowed by current neutrino oscillation data. In this work we explore the parameter correlation condition for $\det P = 0$ including the μ - τ reflection symmetry case, formulate the corresponding constraints on f_e and f_μ versus η_e and η_μ , and illustrate to what extent the source flavor distribution can be mapped by using the recent IceCube all-sky neutrino flux data ranging from 5 TeV to 10 PeV under the assumption that the relevant sources have a common flavor composition.

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Session Classification : Particle Phenomenology (Room B)