

W37a Core-collapse supernovae neutrinos: Effect of energy-dependent scattering on fast collective neutrino oscillations

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In astrophysical environments such as supernovae, where neutrinos are plentiful, collective neutrino oscillations play a crucial role in transporting lepton flavor. Although intensive and extensive studies have been undertaken to unravel the explosion mechanism of supernovae, the evolution of neutrino flavor conversion in supernova cores remains a mystery. It is known that neutrino self-interactions in dense neutrino media such as supernova cores can trigger a change in collective neutrino oscillations. Understanding the physics of neutrino flavor conversions is very important as if collective neutrino oscillations occur fast in supernova cores, they can regenerate stalled bounce shocks and provide energy for supernova explosions.

In this talk, I will present our latest results on the study of the dynamics of fast neutrino flavor conversions with collisions under energy-dependent treatment. I will present how the neutrino flavor conversion will be significantly enhanced if the energy-dependent collision term is considered in the neutrino transport equation which has been ignored in previous studies. It is believed that this effect may have implications for core-collapse supernova explosion mechanisms, nucleosynthesis, and neutrino astronomy.