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Numerical modeling of neutrino quantum kinetics in high energy astrophysical phenomena

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Neutrinos are key players in core-collapse supernova explosion (CCSN) and binary neutron star mergers (BNSM) as the dominant courier of energy and lepton-number. The neutrino kinetics including transport, neutrino-matter interactions, and neutrino flavor conversions (or neutrino oscillations) would account for triggering CCSN explosion, driving disk-outflows in remnants BNSM, and having influence on nucleosynthesis in these ejecta. Determining neutrino radiation field involving neutrino flavor conversion requires solving quantum kinetic equation, corresponding to an extension from classical Boltzmann equation. Although numerical modeling of neutrino quantum kinetics is a nascent field, a remarkable progress has been made in the last few years. In this symposium, I will review these progresses, paying a special attention to those relevant to CCSN and BNSM.

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