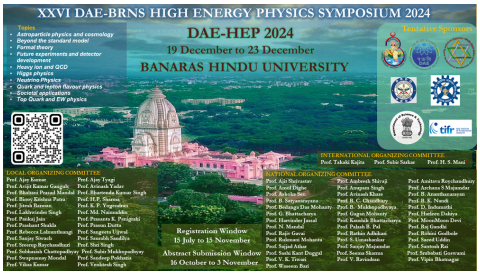

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Neutrino Oscillation in a Core-Collapse Supernova: The Impact of Spacetime Geometry

Neutrino flavor evolution inside a core collapse supernova is a topic of active research at present. The core of a supernova is an intense source of neutrinos and antineutrinos. The self-interaction among the neutrinos (as well as antineutrinos) gives rise to a rich phenomenology which is not seen in terrestrial situations. In studies of dynamics of flavor evolution in such environments, the gravitational effects are generally ignored. Although the curvature outside a dense core does not deviate much from a flat space, the spin of the neutrinos can still couple to the torsion of the spacetime. These extra degrees of freedom of curved spacetime have interaction strengths which are proportional to the density of the neutrinos and the other fermions [1, 2] as well as the coupling constants of the spin-torsion interaction. We have studied the effects of such interactions in flavor evolution inside a core collapse supernova [3]. The self interaction gets modified by the spin-torsion interaction and the oscillation dynamics is modified. We have seen that there are noticeable changes in the flavor dynamics when the neutrino density is uniform. We have also studied the effects of such interaction in a realistic core collapse suepernova (CCSN). As the neutrino astronomy enters the precision era, this study will shed light on the potential of neutrino fluxes from CCSN to probe the neutrino-neutrino interaction.

References:
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Field of contribution

Phenomenology

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