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UNIVERSITÀ
DI TRENTO
Dipartimento di
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November 25, 2025 – 10:00 a.m.

Fortuna Room - TIFPA

Neutrino fast flavor oscillation in neutron star mergers

Abstract

Neutrino flavor oscillations are ubiquitous in neutron star mergers, affecting the merger dynamics and the electron fraction of the ejecta, which will subsequently impact the r-process nucleosynthesis and heavy-element abundances. Over the years, numerous studies have explored neutrino physics in dense environments such as those found in neutron star mergers. These studies suggest that flavor oscillation due to instabilities can be significant close to the central compact object. To account for these flavor instabilities, merger simulations need to solve the neutrino quantum kinetic equations. However, solving the quantum kinetic equation directly in a merger simulation is far from feasible, even with the available high-performance computational resources. In this talk, I will present our efforts to incorporate flavor instabilities, particularly fast flavor instabilities, in mergers using subgrid modeling. I will present a machine-learning model and an analytical mixing scheme that can predict the outcome of fast flavor oscillation on post-merger snapshots and compare their performance. I will also discuss the challenges of incorporating these models into the available neutrino transport scheme

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