Contribution ID: **59** Type: **not specified**

Advances in Numerical Relativity for Modeling Compact Binaries and Gravitational Wave Emission

Abstract:
Numerical relativity (NR) has revolutionized our understanding of strong-field gravity, enabling high-fidelity simulations of compact binary systems. This paper reviews recent breakthroughs in NR methodologies, with emphasis on binary neutron star (BNS) and black hole–neutron star (BHNS) mergers. We discuss advancements in adaptive mesh refinement, constraint-damping formulations, and microphysical treatments of neutron star matter. These developments have refined predictions of gravitational waveforms, kilonova signatures, and remnant behavior, directly impacting multimessenger astronomy. We also present new results from simulations of high-spin BHNS systems and high-mass-ratio BNS mergers, highlighting implications for upcoming gravitational wave detectors (e.g., Einstein Telescope, Cosmic Explorer) and nuclear astrophysics.

Author: TAHERKHANI, vahid (phd student in astronomy &astrophysics in zanjan university)

Presenter: TAHERKHANI, vahid (phd student in astronomy &astrophysics in zanjan university)