



Contribution ID: 40

Type: poster

Spritz: a new fully general relativistic magnetohydrodynamic code

Wednesday, 20 February 2019 17:46 (1 minute)

I will present few initial steps towards a new general relativistic magneto hydrodynamic (GRMHD) code devoted to the study of compact binary mergers with finite temperature equations of state and neutrino emission. Numerical modeling of neutron stars binaries (NS-NS), black holes binaries (BH-BH) and neutron star black hole binaries (NS-BH) has now become one of the most important fields of study in theoretical astrophysics, because it allows to extract physical information from gravitational wave (GW) and electromagnetic signals by comparing simulated data with observations. Focusing on the NS-NS and NS-BH cases in particular, it has been shown many times that only a fully general relativistic treatment taking also into account magnetic fields may give a complete picture of this scenario and this requires to solve the equations of GRMHD. From a numerical point of view, one of the most demanding conditions imposed by the system of equations to be solved is the so-called divergence-free condition for the magnetic field. In my work I chose to consider the magnetic field coming out from a vector potential, in order to let the aforementioned conditions be automatically satisfied. In addition, I also consider a general treatment for the NS Equation Of State (EOS) allowing for the use of finite temperature tabulated EOS. This new code will also implement neutrino cooling in order to provide a more accurate study of the post merger phase.

Summary

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Session Classification: Poster session

Track Classification: Gravity: theory