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(G*) The Equation of State of Ultra-Dense Matter and its Implication for the Diffuse Neutrino Background

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The equation of state of ultra-dense matter, which gives a relation between microscopic and macroscopic quantities of ultra-dense objects and describes the core of the most energetic events of the universe, remains incompletely understood, particularly under extreme conditions such as high temperatures (i.e. in the order of ˜10 MeV). In order to compute the hydrodynamic simulation of a binary neutron star merger, the choice of an equation of state is required, and this choice will influence the evolution of the system. For instance, the spectrum of neutrinos emitted during this event and that we can detect on Earth will be different for a different equation of state. Therefore, binary neutron star merger's neutrinos carry information about the equation of state of ultra-dense matter; their number as well as the shape of their predicted spectrum can be compared to detection in neutrino observatories. However, binary neutron star mergers are rare, and neutrinos are hard to detect. Rather than focusing on the neutrinos coming from a single event, this study suggests examining the contribution of binary neutron star mergers to the diffuse neutrino background. This comparative analysis between theoretical predictions and observed data will allow to constrain the equation of state of ultra-dense matter for use in simulations.

Keyword-1

Neutron stars

Keyword-2

Neutrinos

Keyword-3

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