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(G*) (POS-17) Study of the Equation of State of Hot Ultra-Dense used to describe Binary Neutron Star Mergers

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Neutron stars are very dense objects that result from the death of a main-sequence star with an original mass between 8 and 25 solar masses. Studying the interior of these stars through events such as binary neutron star mergers can help explain the behavior of ultra-compact matter similar to that found inside an atomic nucleus. During these mergers, gravitational energy transfers to neutrinos which escape the stellar matter, carrying information about the equation of state of neutron stars with them. To test our understanding of nuclear matter in extreme conditions, we can compare neutrino yields detected in neutrino observatories on Earth to theoretical yields. Theoretical yields are calculated using binary neutron star merger simulations with different ultra-compact matter equations of state to account for the number of neutrinos produced during a merger. The three different equations of state used are SFHo, DD2, and NL3. This study sets out to determine if the equation of state of ultra-compact matter impacts the cosmic neutrino background, and, if so, if detection of this effect is possible in neutrino observatories. We found that the SFHo equation of state results in a significantly higher number of neutrinos emitted during the merger when compared to other equations of state.

Keyword-1

Neutron star mergers

Keyword-2

Neutrinos

Keyword-3

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