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# Quark-Matter Equation of State Effects during Binary Neutrons Star Mergers

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In previous work [1] we demonstrated that a crossover transition from hadronic to quark matter during the merger of binary neutron stars can lead to interesting observational consequences in the emergent gravitational waves. In particular, quark matter may cause increased pressure in the crossover density region (2-5 times the nuclear saturation density). This could lead to an extended duration of high frequency (~ 2-3 kHz) gravitational wave emission during the post-merger hyper-neutron-star epoch. However, that study was based upon the QHC19 formulation[2] of the crossover equation of state. The updated QHC21 [3] equation of state has been developed motivated by NICER observations indicating larger radii for neutron stars and even higher pressures in the crossover regime. In this talk we will discuss simulations of neutron-star mergers based upon various equations of state including the QHC21 and QHC19 EoS. In comparison with the previous results we find that the long duration post-merger gravitational-wave emission is even more pronounced when using the QHC21 EoS. Prospects for the detection of the GW emission in the spectral density function via current and future GW observatories will be discussed.
[1] A. Kedia, H. I. Kim, I.-S. Suh, and G J. Mathews, Phys. Rev. D 106, 103027 (2022).
[2] G. Baym, S. Furusawa, T. Hatsuda, T. Kojo, and H. Togashi, Astrophys. J. 885, 42 (2019).
[3] T. Kojo, G. Baym, and T. Hatsuda, Astrophys. J., 934, 46 (2022).

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