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Binary neutron star mergers with a crossover to quark mater: Comparing the QHC19 and QHC21 equations of state

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In previous work [1] it was shown that a crossover transition from hadronic to quark matter during the merger of neutron stars can lead to interesting observational consequences in the emergent gravitational radiation. In particular, the increased pressure in the crossover density region ($2-5$ times the nuclear saturation density) can lead to an extended duration of high frequency ($\sim 2-3$ kHz) gravitational wave emission during the post merger epoch. However, that study was based upon the QHC19 formulation of the crossover equation of state. More recently, the updated QHC21 version has been developed based upon the NICER observations suggesting larger radii for neutron stars. In this talk we will discuss new simulations of neutron-star mergers based upon the QHC21 EoS. In comparison with the previous results we find that the long duration post-merger gravitational-wave emission is even more pronounced in the QHC21 EoS. Prospects for the detection of the GW emission in the spectral density function via current and future GW observatories is discussed.

[1] A. Kedia,1 H. I. Kim, I.-S. Suh, and G. J. Mathews, Phys. Rev. D 106, 103027 (2022).

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