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Was GW170817 indeed a merger of two neutron stars?

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The merger of two compact stars is the celebrated event in Astrophysics which provides highest baryon densities and temperatures simultaneously as well as compact objects at the limit of stability, most likely in a transition stage to a black hole which, triggered by a gravitational wave signal, is then observable in all wavelengths of the electromagnetic spectrum, in some cases also in neutrinos.
The first example of such an event is GW170817 [1] which marks the begin of the era of multi-messenger Astronomy and is traditionally referred to as "neutron star (NS) merger". With a total mass of 2.73 $M_\odot$ its progenitor was most likely a binary system like the Hulse-Taylor system of the "double pulsar"system J0737-3039 with stars of the typical binary radio pulsar mass of 1.35 $M_\odot$ involved. We discuss the characteristic features of an equation of state (EoS) of compact star matter with a strong phase transition that would allow for the occurrence of mass twin compact stars in that mass range as a consequence of a "third family"branch of hybrid stars (HSs) in the mass range from ˜1.3 to ˜2.0 $M_\odot$ [2-5]. This offers the possibility of a scenario of HS-NS or HS-HS merger for GW170817 which should therefore be taken into consideration when implications of GW170817 for nuclear and particle physics are discussed. If the NICER experiment on board of the ISS would measure a large radius of ˜14 km for the nearest millisecond pulsar PSR J0437-4715, this would give strong support to the idea that a HS was involved in GW170817 [2].

[1] B.P. Abbott et al. [LIGO Scientific and Virgo Collaborations], Phys. Rev. Lett. 119, 161101 (2017).
[2] D. Blaschke and N. Chamel, "Phases of dense matter in compact stars", [arxiv:1803.01836] (2018).
[3] A. Ayriyan et al., Phys. Rev. C 97, 045802 (2018).
[4] V. Paschalidis et al., Phys. Rev. D 97, 084038 (2018).
[5] D. E. Alvarez-Castillo et al., "Third family of compact stars within a nonlocal chiral quark model equation of state", [arxiv:1805.04105] (2018).

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