Dipartimento di Fisica
Università di Cagliari
INFN, Sezione di Cagliari

High Energy Physics Colloquia

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A multimessenger analysis of neutron star mergers: a tool for dense matter nuclear physics

Abstract

We discuss the different signals, in gravitational and electromagnetic waves, emitted during the merger of two compact stars. We will focus in particular on the possible contraints that those signals can provide on the equation of state of dense matter. Indeed, the stiffness of the equation of state and the particle composition of the merging compact stars, strongly affect e.g. the life time of the post-merger remnant and its gravitational wave signal, the emission of the short gamma-ray-burst, the amount of ejected mass and the related kilonova. The first detection of gravitational waves from the merger of two compact stars in August 2017, GW170817, and the subsequent detections of its electromagnetic counterparts, GRB170817A and AT2017gfo, is the first example of the era of "multi-messenger astronomy": we discuss what we have learned from this detection on the equation of state of compact stars and we provide a tentative interpretation of this event, within the two families scenario, as due to the merger of a hadronic star with a quark star.

* G.F. Burgio, A. Drago, G. Pagliara, H.J. Schulze, J.B. Wei, "Has deconfined quark matter been detected during GW170817/AT2017gfo?" *arXiv:1803.09696*.

† A. Drago et al., "The merger of two compact stars: a tool for dense matter nuclear physics" *Universe 4 (2018) no.3, 50*.

‡ A. Drago, G. Pagliara, "Merger of two neutron stars: predictions from the two-families scenario" *Astrophys.J. 852 (2018) no.2, L32*.

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