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Gravitational-wave data analysis for constraining the NS EoS

The first detection of a gravitational-wave signal from a binary neutron star coalescence, known as GW170817, by the LIGO and Virgo observatories, signifies the beginning of a new era in astrophysics. By analysing gravitational wave signals from neutron star binaries, using adequate modelling of matter effects, we can constrain the barotropic equation of state (EoS) of cold matter at supranuclear densities found in the neutron-star interior. In this talk I will summarise the analyses performed on GW170817, that allowed us to measure the *tidal parameters* of the two neutron stars and put tight constraints on their *radii*. These measurements also translate to constraints on the pressure-density function that defines the EoS, excluding a range of stiff EoS models. I will then discuss the prospects of extracting additional useful information by modelling and analysing the *post-merger* part of such events. In the last part of the talk we will explore methods for *combining information* from the multiple detections expected in the coming years and for exploiting the potential of *multi-messenger* observations, in order to improve our measurements on the properties of neutron-star matter.

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