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Inference of PNS physical parameters in CCSN from GW data

The emission of gravitational waves during a Core-Collapse Supernova is directly related to the oscillations of the proto-neutron star created during the collapse. In the case of a real CCSN event, the analysis of the GW data in the ground-based interferometer network could provide valuable information on the dynamics of the PNS. We base our study on a universal model that relates the frequency of the dominant oscillation mode (g2 mode) and some physical parameters of the PNS. We first develop a multi-detectors coherent analysis method to extract in the GW data the evolution of this g2 mode from which we can then infer the relevant physical parameters of the PNS with the universal relation. Applying this method to the case of a galactic source, we show the importance of a large detector network in order to have a wider coverage of the sky at any given time. The third generation detectors Einstein Telescope and Cosmic Explorer will even allow us to consider the reconstruction of the GW signal emitted by a CCSN in a nearby galaxy.

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