



Contribution ID: 9

Type: **not specified**

Two-body dynamics and gravitational waves in general relativity

Monday, September 28, 2020 9:00 AM (1 hour)

The monumental discovery of gravitational waves by the LIGO-Virgo detectors confirms the sophisticated predictions from general relativity and emphasizes the importance of theoretical works (both analytical and numerical) on the compact binary dynamics: two black holes or neutron stars initially detected in close inward spiralling orbits will merge to form a single massive black hole, producing a burst of gravitational waves. In this talk, after motivating remarks on the properties of gravitational waves and the new gravitational astronomy, we shall describe the analytic two-body problem in general relativity, and the post-Newtonian (PN) approximation which allows an accurate description of the inspiralling phase of compact binaries, and plays a crucial role in the definition of the gravitational wave templates used in the data analysis of the detectors. We shall also mention some recent developments where the PN approximation is computed using the effective field theory and a diagrammatic expansion in the classical limit of general relativity.

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