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Diagrammatic Effective Field Theory approach to coalescing binary systems in General Relativity and gravitational waves phenomenology

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An accurate modeling of the gravitational waves emitted by coalescing binary systems, comprising black holes and neutron stars, is fundamental to fully leverage the capabilities of current and next-generation gravitational wave detectors.
In particular the inspiral phase of the binary system can be described using several approximation schemes, among which the post-Newtonian (PN) formalism.
In the last 20 years the evaluation of higher order post-Newtonian corrections has advanced further thanks to an Effective Field Theory approach and the application of multi-loop quantum field theory techniques. We study this modern approach, implementing the whole evaluation of conservative diagrams in a Mathematica code, which allows to compute also some conservative diagrams first appearing at 7PN order.
Then, employing a Fisher Information Matrix analysis, we forecast the constraints that the future space-based LISA interferometer will be able to provide regarding parametric deviations from the post-Newtonian theory.

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