

# Resuming PM and PN Gravitational Waveform Expansions

*Tuesday 2 September 2025 15:20 (20 minutes)*

In this presentation we expose the results of a recent study concerning a new way of resumming, at a given order in the soft limit, the infinite series of PM or PN corrections to the gravitational waveform produced by a particle moving around a Schwarzschild black hole in the test mass limit. The tool that has allowed to do this is a novel hypergeometric representation of the confluent Heun functions. Indeed the propagation of the emitted gravitational waves is described by the radial part of Teukolsky equation, which can be recast as a confluent Heun equation. In order to analyze the development of this procedure, we compute the total energy flux at infinity in case of circular orbits. We find very good agreement with MST method. For this reason, we are considering some more-in-depth applications of the previous proposal, consisting in writing the waveform in the factorized form proposed by 0811.2069. The goal is seeing how the new resumed version of the tail contributions describes the result against the numerical one. We find that the relative error at the LSO can be even decreased at  $10^{-6}$ . Furthermore, we discover that this method can be extended also to the case of binary systems with comparable masses. Based on 2501.19257 and on an ongoing work with Alessandro Nagar, Francesco Fucito and José Francisco Morales.

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