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Extreme mass ratio inspirals via a multiple time expansion TANJA HINDERER, EANNA FLANAGAN, Cornell University — Extreme mass ratio inspirals such as a stellar mass compact object orbiting a massive black hole at the center of a galaxy are an important source for the planned space-based gravitational wave detector LISA. To extract information from the signal requires accurate theoretical models as templates for matched filtering. One of the approaches for generating detection templates, the use of conservation laws, relies on the adiabatic approximation and there are some concerns as to the reliability of this approximation because in the weak field regime, it neglects important contributions to the phase from conservative pieces of the self-acceleration. We analyze this problem using a multiple time expansion, which is a standard tool for describing dynamical systems. This method allows us to show rigorously that the adiabatic approximation correctly gives the leading order phasing and establishes a mathematical framework for calculating the post- adiabatic phasing needed for measurement templates.

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