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IMPROVED EOB MODEL FOR EMRIs SIMULATION

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The Extreme Mass Ratio Inspirals (EMRIs) are critical astrophysical systems in the study of gravitational waves, where a stellar-mass compact object spirals into a supermassive black hole. Accurate modeling of EMRIs is essential for the success of space-based gravitational wave detectors like LISA. This work presents an improved Effective-One-Body (EOB) model tailored for simulating the EMRIs inspiral with enhanced precision and computational efficiency.
For the orbital part the changes include a new resummation at lower PN compared to the 22PN previously used, with a different treatment of the logarithmic term. In the scenario where the SMBH is a Kerr black hole a different resummation technique is developed based on a separation between the spin even part - which includes the purely orbital part- and the spin odd part.
The model is tested against Gravitational Self Force datas, demonstrating substantial improvements and an improved mathematical consistency. This enhanced EOB model offers a significant step forward in our ability to detect and analyze gravitational wave signals from EMRIs, providing deeper insights into the nature of strong-field gravity and the astrophysical environments surrounding supermassive black holes.

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