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Waveforms from plunges into a Schwarzschild black hole

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Within general relativity, the planar motion of a small body around a supermassive Schwarzschild black hole admits a quasi-circular inspiral followed by a transition across the innermost stable circular orbit (ISCO) and a final plunge behind the event horizon. Waveforms from second-order self-force theory compare remarkably well with numerical relativity simulations in the regime of comparable-mass binaries. However, these 1PA templates break down at the ISCO. The transition and plunge regimes are expected to be crucial for modelling systems with intermediate mass ratios and nearly comparable masses, which have already been observed by the ground-based detectors of the LVK Collaboration during the latest O3b run. After presenting the transition approximation at last year's Capra meeting, in this talk I discuss the final plunge, obtaining a framework for complete waveforms in Schwarzschild spacetime that extend beyond the ISCO. I consider both the orbital motion and the field equations, and focus on enforcing the match with the late transition.

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