

Spinning-black-hole scattering and the test-black-hole limit  
at second post-Minkowskian order

Justin Vines, Jan Steinhoff, Alessandra Buonanno

Recently, the gravitational scattering of two black holes (BHs) treated at the leading order in the weak-field, or post-Minkowskian (PM), approximation to General Relativity has been shown to map bijectively onto a simpler effectively one-body process: the scattering of a test BH in a stationary BH spacetime. Here, for BH spins aligned with the orbital angular momentum, we propose a simple extension of that mapping to 2PM order. We provide evidence for the validity and utility of this 2PM mapping by demonstrating its compatibility with all known analytical results for the conservative local-in-time dynamics of binary BHs in the post-Newtonian (weak-field and slow-motion) approximation and, separately, in the test-BH limit.