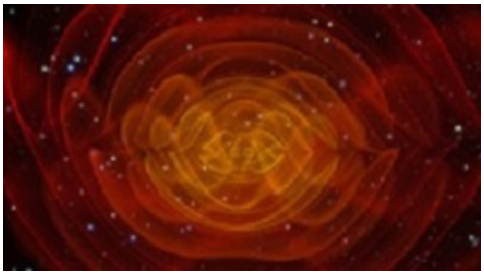

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Scattering of two spinning black holes and effective-one-body mappings

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The net results of scattering processes can be seen to fully encode the gauge-invariant content of (unbound and bound) two-body dynamics. We present new results for the scattering of two spinning black holes (BHs), with an arbitrary mass ratio and with generic spin orientations, in the first post-Minkowskian (1PM) approximation to general relativity—to linear order in G, but to all orders in 1/c, and to all orders in both BHs' spins. The results are seen to fully reproduce and "resum" the linear-in-G parts of all previous post-Newtonian results for spinning-binary-BH dynamics, through 4PN order. The results also reveal a complete equivalence at 1PM order, under simple mappings, between arbitrary-mass-ratio two-spinning-BH dynamics and both (i) the dynamics of a spinning test BH (with all of the spin-induced BH multipoles) in a Kerr spacetime, and more surprisingly (ii) geodesic (point-test-mass) motion in a Kerr spacetime. We discuss implications for effective-one-body models and preview the situation at 2PM order.

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