

Effective Field Theory for Extreme Mass Ratios (part 2)

Monday 11 December 2023 15:00 (30 minutes)

The standard approximations to the two-body problem in General Relativity include weak-field perturbation theory (“PN” and “PM”) and a strong-field scheme which expands in powers of the mass ratio but retains all orders in G -Newton, ie. “self-force”. I’ll discuss recent work which used inspiration from self-force to simplify perturbative computations. We introduce an effective field theory describing a pair of gravitationally interacting point particles in an expansion in their mass ratio. The leading (0SF) dynamics are trivially described by geodesic motion in curved spacetime and at higher SF orders the perturbations of the 0SF exact solution are accounted for by a small number of operators, eg. a recoil operator encoding backreaction onto the heavy body. Rather than building-up curved spacetime perturbatively, this approach leverages known non-perturbative solutions and unpacks them into very simple perturbative building blocks—suggesting a path towards simplified multi-loop integrands for higher PM orders. We’ll mention a variety of old and new two-loop results computed using this EFT.

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