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Eccentric-orbit extreme-mass-ratio inspirals: Analytic expansion in the conservative sector of black hole perturbation theory to high PN order CHRISTOPHER MUNNA, CHARLES EVANS, University of North Carolina at Chapel Hill — We present new advances in determining analytic PN series for extreme-mass-ratio inspirals on a Schwarzschild background. We focus on a pair of gauge invariant quantities, the redshift invariant and spin-precession invariant, which help encode the conservative dynamics of these binaries under first-order black hole perturbation theory. The PN series are pursued using direct expansion of the MST solutions to the RWZ equations, along with a PN ansatz solution for RWZ equations with large mode number l. We compute the redshift invariant to 8.5PN through 20th order in eccentricity, finding that at multiple PN orders the eccentricity expansion exhibits a structured appearance which permits the extraction of a compact eccentricity function. Then, we utilize similar techniques to determine the spin-precession invariant to 6.5PN through 16th order in eccentricity. We conclude by discussing future applications to the more complicated Kerr problem.

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