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Tidal invariants for compact binaries on quasi-circular orbits NIELS WARBURTON, Massachusetts Institute of Technology, SAM DOLAN, University Of Sheffield, PATRICK NOLAN, ADRIAN OTTEWILL, University College Dublin, BARRY WARDELL, Cornell University — We extend the gravitational self-force approach to encompass 'self-interaction' tidal effects for a compact body of mass μ on a quasi-circular orbit around a black hole of mass $M \gg \mu$. Specifically, we define and calculate at $O(\mu)$ (conservative) shifts in the eigenvalues of the electric- and magnetic-type tidal tensors, and a (dissipative) shift in a scalar product between their eigenbases. This approach yields four gauge-invariant functions, from which one may construct other tidal quantities such as the curvature scalars and the speciality index. First, we analyze the general case of a geodesic in a regular perturbed vacuum spacetime admitting a helical Killing vector and a reflection symmetry. Next, we specialize to focus on circular orbits in the equatorial plane of Kerr spacetime at $O(\mu)$. We present accurate numerical results for the Schwarzschild case for orbital radii up to the light-ring, calculated via independent implementations in Lorenz and Regge-Wheeler gauges. We show that our results are consistent with leading-order post-Newtonian expansions, and demonstrate the existence of additional structure in the strong-field regime. We anticipate that our strong-field results will inform (e.g.) effective one-body models for the gravitational two-body probl

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