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Computing the dissipative part of the gravitational self force: I. Formalism EANNA FLANAGAN, Cornell University, TANJA HINDERER, Albert Einstein Insitute, Golm, Germany, SCOTT A. HUGHES, UCHUPOL RUANGSRI, MIT — The computation of the gravitational self-force acting on a point particle inspiralling into a spinning black hole is a subject of much current research, and is relevant to future gravitational wave observations. We develop a formalism for numerically computing the dissipative part of the self-force for generic orbits, omitting the conservative part. The dissipative part contains both orbit-averaged and oscillatory pieces, is sufficient to compute the leading order, adiabatic inspiral, and will also yield information about the kicks to the particle's energy and angular momentum that occur during transient resonances. The dissipative self-force can be computed from the half-advanced minus half-retarded prescription, for which no regularization is needed. The method involves a simple modification of frequency domain Teukolsky codes that compute the retarded linearized metric perturbation, in which a more general type of mode amplitude is computed. In the future, it may be possible to develop complementary methods to compute the conservative part only, which are simpler than methods currently under development that aim to compute the entire first order self-force.

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