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Gravitational waves from extreme mass ratio inspirals: A numerical model for the singular source term in the time domain PRANESH ADHYAM SUNDARARAJAN, MIT, GAURAV KHANNA, University of Massachusetts, Dartmouth — Radiation from a point particle orbiting and thus perturbing a massive black hole is a promising source of gravitational waves. The Teukolsky perturbation equation contains the Dirac-delta function and its derivatives when specialized to represent a point particle. We present a model to discretize the delta function (and its derivatives) and thus solve the equation as a (2+1) PDE on a numerical grid in the time domain. The derivation of this model is motivated by preserving the discrete versions of the integral properties of the delta function and its derivatives. We present gravitational waveforms and energy fluxes calculated at a point far from the horizon. Where comparisons are possible, these numerically extracted fluxes are accurate to within 1% of earlier work. Comparisons with earlier source models show an order of magnitude gain in speed (performance). In the near future, we intend to use this numerical laboratory to study gravitational wave emission from astrophysically realistic binary systems.

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