

Abstract Submitted
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Model for Quasinormal Mode Excitation by a Particle Plunging into a Black Hole ZACHARY MARK, California Institute of Technology, AARON ZIMMERMAN, Canadian Institute for Theoretical Astrophysics, HUAN YANG, Perimeter Institute, YANBEI CHEN, California Institute of Technology — It is known that the late time gravitational waveform produced by a particle plunging into a Kerr black hole is well described by a sum of quasinormal modes. However it is not yet understood how the early part of the waveform gives way to the quasinormal mode description, which diverges at early times, nor how the inhomogenous part of the waveform contributes. Motivated by Price, Nampalliwar, and Khanna (2015), we offer a model for quasinormal mode excitation by a particle plunging into a Schwarzschild black hole. To develop our model we study approximations to the Regge-Wheeler equation that allow for a closed-form expression for the frequency-domain Green's function, which we use to isolate the component of the waveform that should be identified with quasinormal ringing. Our description of quasinormal ringing does not diverge at early times and reveals that quasinormal ringing should be understood in analogy with a damped harmonic oscillator experiencing a transient driving source.

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