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**Generic Ringdown Frequencies at the Birth of a Kerr Black Hole**[1]

AARON ZIMMERMAN, YANBEI CHEN, Caltech — The final phase of the gravitational radiation emitted at the birth of a Kerr black hole is made up of decaying sinusoids, oscillating at the complex quasi-normal mode (QNM) frequencies, and weak power law tails. In particular, the QNMs arise as eigenmodes of the homogeneous linearized Einstein's equations, plus appropriate boundary conditions. We present a new set of generic "ringdown" frequencies, which have been found by analytically evolving generic, regular initial data for the vacuum Teukolsky equation in a near horizon expansion, following the strategy of Mino and Brink (2008). This set of modes has frequencies proportional to the horizon frequency of the black hole, and decay rates proportional to the surface gravity. We comment on our results in the context of this previous study. A full understanding of the ringdown frequency modes is essential for creation of accurate gravitational waveforms for use in gravitational wave detection. We explore the utility of these new modes in fitting a ringdown gravitational waveform produced by the numerical evolution of a binary inspiral.

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