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Development of more fundamental black-hole binary merger waveforms SEAN MCWILLIAMS, West Virginia Univ — The discovery of GW150914 and the additional subsequent black-hole binary discoveries made possible by LIGO have been a triumph of theoretical physics as much as experimental physics. Only within the last decade has the state-of-the-art in modeling the final merger waveform in particular become sufficiently accurate to effectively analyze the available data. The advancements within the last decade have been facilitated by the achievements in numerical relativity, and the development of phenomenological models, particularly the "EOBNR" and "IMRPhenom" families, that can be tuned to available numerical results. While the resulting models provide an effective interpolant for mergers across much of parameter space, they do not provide insight into the underlying dynamics that drive the late inspiral and merger-ringdown waveforms to take the shapes that they do. As a result, these phenomenological approaches may not be sensitive to subtle features in the waveforms, and may not have small enough systematic uncertainties in the era of very loud signals from next-generation ground- and space-based observatories. We will present results of our ongoing effort to address this shortcoming, by developing a method for modeling the final stages of these waveforms that has a stronger foundation in first principles, and avoids the need for tunable degrees of freedom across a subset of parameter space, with clear prospects for extending the methods across a broader range of physical systems.

Sean McWilliams
West Virginia Univ

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