DOCTORAL DEFENSE

The Equations of Motion of the Post-Newtonian Compact Binary Inspirals As Gravitational Radiation Sources Under The Effective Field Theory Formalism

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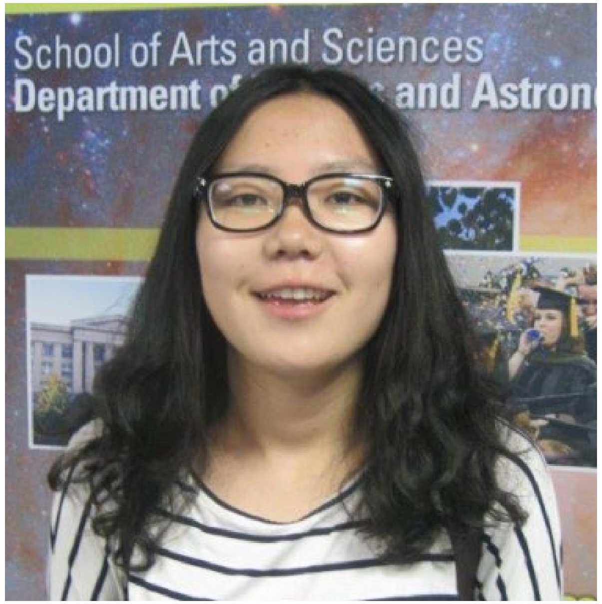

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Zoom ID: 787 293 9510
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Abstract: The success of advanced LIGO/VIRGO detections of gravitational wave signals beginning in 2015 has opened a new window on the universe. Since April 2019, LIGO's third observing run has identified binary merger candidates with a rate of roughly one per week. In order to understand the properties of all the candidates, it is necessary to construct large template banks of gravitational waveforms. Future upgrades of the LIGO detectors and the next generation detectors with better sensitivity post challenges to the current calculations of waveform solutions. The improvement of the systematic and statistical uncertainties calls for higher accuracy in waveform modeling. It is also crucial to include more physical effects and cover the full parameter space for the future runs.

This thesis focuses on the equations of motion of the post-Newtonian compact binary inspirals as gravitational wave sources. The second post-Newtonian order corrections to the radiation reaction is calculated using the Effective Field Theory formalism. The analytical solutions to the equations of motion and spin precession equations are obtained using the dynamical renormalization group method up to the leading order in spin-orbit effects and radiation reaction.