

GR 12: GW V

Time: Thursday 16:15–16:55

Location: ZHG008

GR 12.1 Thu 16:15 ZHG008

Close, but no Merger: Challenges in Parameter Estimation for Black Hole Hyperbolic Orbits — ●JOAN FONTBUTÉ — Friedrich-Schiller Universität

In this talk, I will be introducing a surrogate numerical-relativity model for close hyperbolic encounters between equal-mass black holes with aligned spins. This model spans a range of impact parameters and spin components, focusing on key gravitational wave emission multipoles. It closely matches numerical relativity simulations, with mismatches below 0.1%. Despite the model's accuracy, I'll argue that parameter estimation proves challenging due to strong degeneracies in the parameter space, even for high signal-to-noise ratios (SNRs). This suggests that detecting such events may require third-generation detectors. However, certain parameter combinations proposed in this project may still provide evidence of these encounters using the current ground-based detectors, provided they are astrophysically meaningful.

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Subdominant multipole asymmetries in gravitational waves from binary black-hole mergers — ●JANNIK MIELKE^{1,2},

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In some binaries, the spins of the black holes are not aligned with the system's orbital angular momentum. This causes the spins to precess and leads to an asymmetric emission of gravitational waves. Interestingly, multipole asymmetries which describe this asymmetric emission, are strongly related to the final kick of the remnant black hole and are the critical element in fully describing precession. Despite the astrophysical significance of kicks and precession, multipole asymmetries contribute only minimally to the overall signal strength. Consequently, the majority of current gravitational-wave models do not incorporate them. Moreover, the role of subdominant multipole asymmetries has not been investigated exhaustively. Therefore, this talk discusses the physics of multipole asymmetries, which I present through a systematic study of numerical relativity simulations. In addition, the importance of subdominant multipole asymmetries for the kick calculation will be demonstrated and I give a short outlook for their detectability with third generation detectors.