

A simulation pipeline for nearly circular supermassive black hole binaries

Friday 20 December 2024 09:00 (15 minutes)

Simulation-based modeling has played a crucial role in the interpretation of very long baseline interferometry (VLBI) observations and gravitational wave detections. The experiments planned for the next decades may deliver the first multimessenger observations of supermassive binary black holes (SMBBHs), bringing new challenges for numerical simulations. In this talk, we will discuss our efforts to build a simulation pipeline comprising general relativistic magnetohydrodynamic (GRMHD) simulations and general relativistic radiative transfer (GRRT) calculations. This pipeline is largely based on publicly available tools, making use of the spectral solver Kadath for the spacetime, the GRMHD code BHAC, and the GRRT code BHOSS. Our technique takes advantage of the approximate helical symmetry of binary black hole spacetimes in advanced stages of the inspiral, reducing the computational cost associated to numerical relativity and GRMHD simulations, and allowing to evolve systems for long times, while accurately capturing general relativistic dynamics. We will show the current status of the framework and discuss some applications to modeling SMBBH phenomenology.

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