Contribution ID: **5** Type: **E-Poster Presentation**

Binaries wandering around supermassive black holes due to gravitoelectromagnetism

Sunday, 25 June 2023 17:41 (2 minutes)

Extreme-mass-ratio inspirals are important sources for space-borne gravitational-wave detectors. Such a source normally consists of a stellar-mass black hole (BH) and a Kerr supermassive BH (SMBH), but recent astrophysical models predict that the small body could also be a stellar-mass binary BH (BBH).
A BBH reaching several gravitational radii of a SMBH will induce rich observable signatures in the waveform, but the current numerical tools are insufficient to simulate such a triple system while capturing the essential relativistic effects.
In this talk, I will solve the problem by studying the dynamics in a frame freely falling alongside the BBH. Since the BBH is normally nonrelativistic and much smaller than the curvature radius of the Kerr background, the evolution in the free-fall frame reduces essentially to Newtonian dynamics, except for a perturbative gravitoelectromagnetic force induced by the curved background.
I will use this method to study the BBHs on near-circular orbits around a SMBH and track their evolution down to a distance of 2–3 gravitational radii from the SMBH. The simulations reveal a series of dynamical effects that are not shown in the previous studies using conventional methods. The most notable one is a radial oscillation and azimuthal drift of the BBH relative to the SMBH. These results provide new insight into the evolution and detection of the extreme-mass-ratio inspirals containing BBHs.

Primary authors: Mr ZHANG, Zhongfu (□□□□); Mr □, □ (□□□□)

Presenter: Mr ZHANG, Zhongfu (□□□□)

Session Classification: Flash Talks