

G. M. Tomaselli: Dynamical Friction in Gravitational Atoms

Thursday, June 8, 2023 11:30 AM (45 minutes)

Due to superradiant instabilities, clouds of ultralight bosons can spontaneously grow around rotating black holes, creating so-called “gravitational atoms”. In this talk, we discuss their dynamical effects on binary systems. We first focus on open orbits, showing that the presence of a cloud can increase the cross section for the dynamical capture of a compact object by more than an order of magnitude. We then consider closed orbits and demonstrate that the backreaction of the cloud’s ionization on the orbital motion should be identified as dynamical friction. Finally, we study for the first time eccentric and inclined orbits. We find that, while ionization quickly circularizes the binary, it barely affects the inclination angle. These results enable a more realistic description of the dynamics of gravitational atoms in binaries and pave the way for dedicated searches with future gravitational wave detectors.