

A. Toubiana: Observing stellar-mass black hole binaries around AGNs with LISA

Thursday, June 8, 2023 10:45 AM (45 minutes)

Recent observations from the LIGO/Virgo/KAGRA collaboration have suggested that stellar-mass black hole binaries (SBHBs) could form in active galactic nuclei (AGN). If so, we expect the environment in which these binaries are embedded to leave an imprint on the gravitational wave signal they emit. These deviations from vacuum waveforms should be more important in the early inspiral, i.e. at early frequencies, exactly the regime LISA will observe SBHBs. In this talk I review some of the effects that are expected, due to the presence of matter and to the peculiar motion of the binary around the central black hole, and show how well LISA could constraint them. Then, I discuss the regime where the SBHB is so close to the central black hole that its orbital period is comparable to the observation time. In this case the GW signal is successively redshifted and blueshifted, an effect that cannot be captured with perturbative modifications to the waveform. I discuss how accounting for this effect will allow us to measure the properties of the central black hole if properly accounted for, but could also prevent us from detecting a signal in the opposite case.