RIT’s Center for Computational Relativity and Gravitation Presents

Gravitational waves from Extreme Mass-Ratio Inspirals as Probes of Accretion Disk Physics

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Abstract:
The future space-based gravitational wave (GW) instrument LISA will be very sensitive to extreme mass ratio inspirals (EMRIs): stellar mass compact objects spiraling into a supermassive black hole. I will discuss the effects of a possible geometrically thin accretion disk on the inspiral, and examine whether these effects can be detected through the phase shifts induced in the GW signal. I will concentrate on three main types of disk effects: the increase in either object’s mass due to accretion, energy and angular momentum loss due to disk effects, and the disk’s self-gravity. We find that the most prominent effects are the gravitational interactions with spiral density waves induced in the accretion disk by the orbiting object, analogous to Type-I and Type-II planetary migration. These effects leave a strong imprint in the GW signal for LISA. Such GW measurements can be used to learn about the properties of the accretion disk, and could provide targets for electromagnetic counterpart searches.