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Correlated Electromagnetic and Gravitational Waves from Supermassive Black Hole Binary Mergers

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Correlated observations of electromagnetic (EM) emission from a gravitational wave (GW) source, an observational grand challenge, would improve the localization of the emitting system and contribute to our understanding of black hole (BH) growth and galaxy evolution. These synergistic emissions could occur when the binary is at such small orbital separations that GW emission dominates the BH inspiral and a fully general relativistic treatment is required. The computational challenge of simulating binary black hole (BBH) systems and the surrounding gas in this regime – resolving lengthscales covering many orders of magnitude and including any physics which may influence EM emission from the region – is now being addressed with significant progress. In this talk, we will discuss the current understanding of EM signatures from fully relativistic simulations of supermassive black hole binaries within two astrophysically motivated environmental scenarios: radiatively inefficient accretion flows and circumbinary disks.