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Gravitational waves as probes of galactic nuclei and accretion physics[1]

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The NASA/ESA Laser Interferometer Space Antenna (LISA) mission is expected to measure, with exquisite precision, the low frequency gravitational waves from tens of super-massive ($10^4 - 10^7 M_\odot$) merging black holes in galactic nuclei at redshifts up to 30, and hundreds of compact objects captured by supermassive black holes in galactic nuclei at redshifts < 2. The long gravitational waveforms will enable precise measurements of the masses, spins, and orbital parameters of these systems, as well as distances and approximate positions. Many of these events are likely to have electromagnetic counterparts: precursors, prompt variability and afterglows from circumbinary disks around the black hole binaries, and tidal disruptions or disk perturbations due to the captured compact objects. The electromagnetic and gravitational wave measurements of these events will provide unprecedented probes of accretion disk structure, and the structure and dynamical interactions between stars, black holes and gas in the central light-year of galaxies.

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